The Builder.

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Archaic Architecture at Corinth.

AMONG the papers included in the volume recently issued by the Athenian Section of the German Archæological Institute, great interest attaches to the report by the present Director, Dr. Dörpfeld, on an accurate exploration of the ruins of the archaic Doric temple at Corinth. The work done here is worthy to be compared in interest with that of the Archæological Institute of America at Assos, conducted, and admirably published, by Mr. J. Thacker Clarke. In some important respects it was not so well rewarded. No sculptured slabs were unearthed, and none of those details of frieze and cornice which enabled Mr. Clarke to reproduce the complete Doric order of the temple at Assos. In both cases the general plan was deeply encumbered with earth, but proved recoverable in all leading particulars when this was removed. The hexastyle of Assos revealed the greatest peculiarities and variation from the type which is elsewhere all but general. The Corinthian has the usual distribution of the cella between naos and opisthodomus, entered respectively from a pronaos and epinaos, each in antis. But at Assos there was neither epinaos nor entrance to the cella on the west, but the plain wall was carried across the rear at the same distance from the steps as upon the sides. Upon the elevation there were these anomalies: the sculptured design upon the architrave, and the drums of the columns so set that the arrises, and not the centres of the channels of the flutes, were in line with the axes of the plan. The slope of the profile of the echinus of the Corinthian example verges to the later and more erect type.

This temple was built of the porous limestone of the district, but a smooth surface was given to it by a very thin coating of exceedingly fine stucco. This method of producing the appearance of a nobler material was employed at Ægina and in many temples of later date, as, for instance, in the great temple of Zeus Olympius at Elis. The Corinthian is the earliest example preserved, and remote as must be its date, it proves that already marble had been used for temple structures, and with such delicacy of treatment and workmanship as to induce attempts to obtain the same effect by a system of imitation at the cost of considerable labour. The Roman colonists of the restored city evidently repaired the temple, which might have suffered from mere lapse of centuries, apart from violence done to it in the devastating conquest by Lucius Mummius. Traces are apparent of their repair of the stucco coating, and a number of thick tiles bearing Latin impress show that they gave it a new roof. In later times it was exposed to those agencies of ruin, storm, earthquake, and despoiling for building materials, which have proved equal to overturning and all but entirely obliterating even such a colossal structure as the Temple of Artemis at Ephesus. Stuart, at the end of the last century, found eleven columns still erect, inclusive of one of the western pronaos and some architraves in position. The pronaos columns had disappeared when the French scientific expedition explored the site in 1820, and only the seven columns remained, which are still standing. These the Greek Government have caused to be secured by underpinning against ruin, which was otherwise too certainly impending.

The progress of excavation soon revealed that no general foundation had been prepared for the building, but that separate foundations were brought up from the solid rock at some depth below for each several column and for the various walls. These foundations had, indeed, been removed from the greater part of the area; their places, however, could nevertheless be determined by manifest traces of the preparations made to receive them. The uneven and sloping rock had not been reduced to a level, nor had the builders been content to simply make smooth surfaces; they sank distinct beds for their lowest courses, and thus inscribed their plan as on a sort of very uneven drawing-board. With this guidance it became demonstrable that the temple had been rightly conjectured by Stuart to be hexastyle; it proved, moreover, to have had fifteen columns on flank, and thus to have been a precedent for the beautiful temple of Apollo at Bassæ, erected at the best period of Greek architecture. Lines of foundation within the limits of the cella testified for interior columns, but did not afford more than a presumption of their exact number and spacing. In the opisthodomos, and near the line of the partition wall, was found preparation for a square solid base, directly opposite to the entrance. It is fair and natural to conclude that this supported the pedestal of a statue,—that of the god or goddess of the dedication. The assignment of this position agrees so far with that which Mr. Cockerell gives conjecturally to the statue of Apollo at Bassæ. Inasmuch, however, as at Corinth there was no door of communication between the two apartments, it seems probable that we have here, as in the case of the Erechtheum, a double temple, and that the eastern naos was assigned to an associated divinity or hero. Pausanias, who mentions other examples of combined temples, unfortunately gives us no assistance towards the attribution of this. What is remarkable, in any case, here is that some superior distinction is given to the western and smaller apartment by the more important dimensions which are afforded for its epinaos, or ante-chamber, as compared with the eastern pronaos. It has a depth of 4·23m., as against 2·71m., a difference of some 4 ft. 6 in.

The only reference which Dr. Dörpfeld makes to an application of definite proportions in the design of the building is as between the relative lengths of the naos (16 m.) and the opisthodomos (9·60 m.), which, he remarks, compare exactly as 5 : 3. But the question is deserving of closer examination if we are to derive the most interesting information of all from the results of this excavation. In the appendix contributed to the splendid work of Mr. Cockerell on the temples of Ægina and Bassæ, will be found some deductions respecting the ruins, which were obtained by comparison of the dimensions furnished by Stuart. These were sufficient to establish that even at the very early date which the design must certainly be referred to, the same principles of adjustment of dimension by strict numerical proportion were in vogue which were developed to the last perfection by Ictinus at Athens and Bassæ. The recognition of the principle is distinct, though its application is naturally more crude. There is the same observanee of a symmetry between the height and spacing of the columns, and of accurate proportion between lower diameters and void intervals. This lower diameter is too nearly one-fourth of the height of the column for the intention to be missed; and the upper diameter, lower diameter, and abacus have the same relative proportions of 3 : 4 : 5 which govern those of the two Æginetan examples.

It was by Athenian architects of the great age that the application of definite proportion to architecture was most profoundly studied as a theory, and most sedulously and scrupulously carried out in practice in executed works; but if genius in the arts, and indeed in philosophy also, culminated at Athens, it was not exclusively native there. It is highly probable that this particular subject may have been primarily dealt with in the flourishing but unrecorded days of archaic Corinth. This city was renowned from earliest times as the home of inventive genius, and did much to vindicate its repute in later historic times. Legend, as usual, was attached to a national characteristic, and it ascribed to the Corinthian hero Bellero-

phon the invention of the bit and bridle,—hence his Pegasus on the wide-spread Corinthian coinage. Pindar adds as other "antique devices" to credit of the city, the origination of the highly-artificial structure of the enthusiastic dithyramb, and of the twin pediments as crowning members of the temples of the gods. On the grand archaic François vase at Florence we have an elevation of a proper Doric façade, distyle in antis, but roofed peculiarly, with no appearance of a pediment,—evidence not to be neglected of the late origin of an architectural feature which was afterwards found susceptible of such noble treatment. Thucydides credits Corinth with the construction of the first trireme,—a model which continued serviceable so long, but of which it has tasked the ingenuity of modern constructors to recover the particulars. It was a Corinthian who afterwards so modified this construction as to foil the onset and manœuvres of the trained Athenian seamen, and so contribute importantly to the rescue of the Corinthian colony of Syracuse.

Instructed by examples of other temples we look in the first instance for an accurate proportion of the length and breadth of the main plan. The dimensions are given as 53·30 m. : 21·32 m., which compare with absolute accuracy as 5 : 2 ; that is, a double square and a half. In the larger dimensions of the Parthenon the ground-plan of 4 : 9, a double square and a quarter, fails of like exactness,—though only by an excess of 0·124 ft. in a length of 228·141.

The echinus of the capital at Corinth exceeds one-tenth of the front top step by as much as 2 in., and no other plausible comparison presents itself. The abacus of the eastern front of the Parthenon is exactly one-fifteenth of the breadth (100 Greek feet) of the top step ; the same dimension applies to the angle abaci of the west front, but there the intermediate smaller abaci are regulated by the proportion of 7 to 8 to the interval from one to another. In the Theseum the abacus is measured by one-twelfth of the top step.

The temple at Corinth follows the usual Doric rule of closing up the columns at the angles, out of regard to the position of the terminal triglyph above. It exhibits, however, a marked example of archaism in a considerable difference of both diameter and interval of columniation between the front and flanks. The architrave stones built into the old wall of the Athenian Acropolis are of such different lengths as to show that this was the case with the temple they belonged to or were intended for ; and the same applies to the probably different temple, of which the plan has recently been laid bare close to the Erechtheum.

The difference at Corinth is between a lower diameter of 1·72m. on front, and 1·63m. on flank, or about 3½ in. in favour of the front. At the same time the more open interval between the columns is 2·28m. front, as against 2·07 m. on flank. This difference of full 8 in. was made subject to strict regulation. On the front the diameter of the column is to the void interval proportioned exactly as 3 : 4 (1·72m. ÷ 3 = 0·57 ; 2·28m. ÷ 4 = 0·57). The like comparison on the flank brings out the proportion of 4 : 5 (1·63m. ÷ 4 = 0·407m. ; 2·07m. ÷ 5 = 0·41.)

A contrast so manifest was given up by later Greek architects as too sudden and harsh ; that it should ever have been applied so strongly is a fact which seems to account for the extraordinary pains which the architect of the Parthenon thought it worth taking in introducing comparatively minute variations of dimensions which no eye could distinctly appreciate or even detect, but which were counted on to produce, nevertheless, an effect of relief of monotony and softening gradation. The stouter angle columns have naturally a broader abacus than those intermediate. Nothing could have been more simple and easy than to make all these others absolutely identical repetitions ; instead of this we find that while the intermediate abacus of the eastern or chief front is adapted for the angle columns on the west ; the smaller western abacus then exceeds those of the south flank, which are nearly uniform, while those on the north flank decrease within moderate but not doubtful limits from east to west. The spread of the echinus of the capital follows the varying breadth of the abacus, but the diameters of the columns apart from those by the angle vary quite inconsiderably.

In the cursory examination which Mr. Penrose in 1846 was able to make he did not detect any curvature of the stylobate of the Corinthian temple, that is, any rise towards the centre upon the principle now so fully illustrated in the "Principles of Athenian Architecture." Dr. Dörpfeld, however, with superior opportunities, certified the fact that even this refinement was among the *archaia sophismata* with which Pindar credits the Corinthians. That the foundations rested undisturbed on the solid rock made it certain that the observable difference from the horizontal was not due to subsidence.

OUTFALL OF THE RIVER WITHAM.

THE lowering of the water level of a river into which land is drained is, for drainage purposes, equivalent to raising the land by as much as the water level is lowered. A remarkable operation of this kind has been effected this year at Boston, in Lincolnshire, where the low-water level of the tidal portion of the river Witham has been lowered several feet at the outfall of four of the main drains of the country, by works executed under the direction of Mr. John Evelyn Williams, C.E., and the effect of this on the drainage of a large tract of low-lying land cannot be stated at less in importance than the virtual raising of that land several feet out of the water. The river Witham may be said to run in an eastwardly direction from Lincoln to Boston and thence to the sea, or rather to the great estuary called the Wash, which receives also the waters of the rivers Ouse, Nene, and Welland ; but for practical purposes of drainage the tidal levels of the estuary may be considered to be those of the open sea. From Lincoln to Boston is thirty-two miles, and from Boston to the sea eight miles, reckoning the distances each way from the sluice upon the river called the Grand Sluice, situated about half a mile above Boston Bridge. Thus, between Lincoln and the sea the river is divided into two portions, an inland portion of thirty-two miles above the Grand Sluice and a tidal portion of eight miles below it. Into this lower portion of the river three of the main drains of the country have their outfall, through sluices called respectively the Black Sluice, about a mile and a half below the Grand Sluice, and on the right bank of the river ; the Maud Foster Sluice on the left bank, about two miles below the Grand Sluice ; and the Hobhole Sluice, about four miles below it, and also on the left bank of the river. The sills over which the water runs out of the drains are at the lowest possible levels to which in each case the water can be drained from the land, and every engineer places the sill of a sea sluice as low down as possible, having regard to the lowest level to which the water falls outside the sluice,—not necessarily quite so low as the lowest level to which the water falls, but always with some reference to that level.

The sills of these sluices on the tidal portion of the Witham are at various levels, and, making any necessary allowance for difference of opinion amongst the engineers who have from time to time carried out the former works of the Witham drainage as to the exact height above low water at which the sill of a sluice should be laid, the various levels at which these sills have been placed indicate very different conditions of the river at different times. Taking the low-water level of ordinary spring tides in the estuary as a general datum from which to reckon the levels of all the sills, the sill of Hobhole Sluice is 1·80 ft. above the datum, that of Maud Foster Sluice is 5·0 ft., Black Sluice 2·40 ft., and the Grand Sluice 6·80 ft. above datum. As this last is eight miles up the river, it would not be expected to be at the same height above the general datum level as the sill of Hobhole Sluice is, because the tide might very probably not ebb out so low at the Grand Sluice as it does at the mouth of the river ; but, as the original sills of the Grand Sluice are 6·80 ft. above the level of low water at the mouth of the river, the fact indicates an extraordinarily bad state of things in the river at Boston, for in that length of river, from the sea upwards, if it were in anything like a tolerable condition for navigation, the fall in the surface of the water at low water would not be more than 1 ft., and probably less, or even perhaps none at all. The "Grand Sluice" was placed there to prevent the tidal water passing further up the river. It is an old work, about which there has been much contention whether it should be removed or not. It has nearly ruined the shipping trade of the port of Boston, but the works recently carried out seem to have revived the trade. Either the removal of the sluice or the execution of the present works was absolutely necessary. The sluice was made in the interests of the owners of the fen lands, and the whole history of the Witham Drainage shows that there has been a continual neglect of the lower or tidal portion of the river, forming the navigable channel from the sea up to Boston, until now that this most important work at the lowest part of the outfall of the river has been done ; a work which has been equally beneficial to the town of Boston, as a port, and to the neighbouring land in respect of drainage ; but the "Grand Sluice" remains. It seems that nobody has been able to persuade the Drainage Commissioners to remove it. Most people say it ought never to have been placed there ; but, being there, the Commissioners have hitherto let it remain. It has, however, been enlarged by the addition of another opening, and its discharging capacity has been made to correspond in some measure with that of the improved channel below it. Before these outfall works were commenced the engineer reported to the Witham Outfall Board, in 1878, that between Boston Church and the Grand Sluice the capacity of the channel for the discharge of ordinary floods was as much as one-fourth less than that of the Grand Sluice itself, and only one-half of the capacity of the river above the sluice, for carrying off a flood. He found, commencing at the lowest point of the outfall of the Witham Drainage, viz., at low water in the estuary, that a spring tide rose 21 ft. in Clayhole, but only 14 ft. 11 in. at Hobhole Sluice, and only 12 ft. 6 in. at the Black Sluice, and the same at the Grand Sluice. Thus the low-water level at Hobhole Sluice was 6 ft. 1 in. above that in the estuary. At the Black Sluice it was 8 ft. 6 in., and at the Grand Sluice 8 ft. 6 in. above the low-water level in the estuary, the reason being, plainly, that the river was full of silt. Upon this report being made, proceedings were taken to deal effectually with the long-standing question of the Witham Outfall, beginning, as every other engineer had previously advised, at the lowest point, and making the improvements gradually upwards.

In May, 1887, Mr. Williams reported that the works were then completed. The most important section of the works is the forming of the new outfall channel between Clayhole, in the estuary, and Hobhole Sluice, in the river,—a work locally known as "The Cut through the Clays." The first sod of this new channel was cut on December 14th, 1880 ; it is three miles in length, and is a mile and a half less in length than the old circuitous channel through the shifting sands. At each end, where the new cut joins,—at one end the sea at Clayhole, and at the other the river near Hobhole Sluice,—a piece of the ground was left in, and an embankment raised upon it high enough to exclude the tides from the workings inside. Between these two embankments the excavation was carried on by means of three powerful steam-navvies, eight locomotives, and numerous barrow and wagon roads, and the extreme ends were afterwards excavated by dredging. The total quantity of excavation was nearly two million cubic yards. Its sectional area is greater than that of either the Suez Canal or the Amsterdam Ship Canal. The first vessel passed through the new channel on April 7th, 1884, and the permanent closing of the old channel was then actively proceeded

with. To effect this it was necessary to form an embankment across it, about half a mile in length, which now joins the parishes of Fishtoft and Wyberton. The old channel was finally closed on August 29th, 1884, and the advantage of the shorter and deeper outfall to Clayhole was immediately seen in the increased velocity of the ebbing waters, and this improvement steadily increased with the advance of the work towards completion in the river above; for, besides this lower and most important portion of the new works, below Hobhole Sluice, the river upwards from this sluice to the Black Sluice has been very materially improved by dredging and the training of the channel by means of fascine work, and in that portion of the channel between the Black Sluice and the Grand Sluice the discharging capacity has been enlarged by dredging and the filling of barges by hand labour. The contracted section of the channel along the Churchstreet frontage has been considerably widened and improved by a new breastwork of timber piling. The navigable depth of the river has been increased 8 ft., and, whereas before the works were carried out the navigable capacity of the Port of Boston admitted vessels of 300 tons only, the formation of the new channel and the other work done in the river have had the effect of admitting vessels of 2,000 tons. With the old circuitous channel the scouring energy of the ebb tide was distributed and broken in struggling seaward through the shifting sands, the channel shifting sometimes a mile from east to west in a few weeks. The incoming tide swept over these broken sands and carried in suspension great quantities of sand and mud as far as the Grand Sluice. The estuary common to this river and those others we have named is a large bay, two thirds of which consist of beds of shifting sands, laid dry at low water. The depth of the estuary varies from 1½ fathoms to 18 fathoms. The foreshore of the coast, where the Witham debouches, is a hard, stiff clay, known by the name of the Scalp, which forms a long elbow. At this elbow the river Welland joins the Witham almost at right angles, and before the new cut was made, the waters of the Witham and the Welland met here and spread themselves out and lost their velocity, and with it the power to move the sands and mud in any defined channel, and the deposit of silt at this point was much increased by the stagnation caused by the two rivers meeting almost at right angles. With these unfavourable conditions of outfall it was impossible to avoid frequent and disastrous floods, as well as the uncertainty and difficulty attending the navigation at those times. On the completion of the new channel the combined scour of the land flood and the tidal waters was concentrated and utilised in maintaining the shorter and deeper outfall to Clayhole; and the incoming tide, instead of rushing up the river as before, heavily charged with matter in suspension, now flows gently in from the estuary, and comparatively clear. With respect to the benefit to the land to be derived from the lowering of the low-water level of the river opposite the respective outfall sluices, it cannot, perhaps, be taken to be actually as much, foot for foot, as this lowering is, because it is the extent of the lowering in dry weather; whereas, as Sir John Hawkshaw said, in a report to the Commissioners of the Witham Drainage in 1861, it is mainly on the depression of the low water in time of floods that the drainage depends. Nevertheless, with so great a depression in the low-water level of the tidal waters as has here been accomplished, that of the flood waters must necessarily follow to almost as great an extent. The absolute gain or depression already acquired on the low-water level at the several sea sluices is as follows, viz. :—At the Grand Sluice, 4 ft.; at the Black Sluice, 4 ft.; at the Maud Foster Sluice, 4 ft. 3 in.; and at the Hobhole Sluice, 5 ft. 6 in. The total expenditure, including Parliamentary expenses and land, has been 167,941*l.* The total area drained into the Witham Outfall is about 700,000 acres, but of this area only 194,649 acres contribute towards the cost of the improvement and maintenance of the outfall works.

NOTES.

TWO returns relating to all authorised gas undertakings in the United Kingdom, the one comprising those belonging to local authorities, the other those other than those of local authorities, have recently been issued. Out of a total authorised capital of 73,069,670*l.*, the sums of 36,639,856*l.* and 19,723,040*l.* have been paid up or borrowed, the first by the Companies, the second by the local authorities. The numbers of 1,133,897 consumers are supplied by the former, and of 996,480 by the latter. The large quantity of 8,657,731 tons of coal have been carbonised, yielding 87,931,537,054 cubic feet of gas. There are 19,443 miles of gas mains and 413,921 public lamps lighted. According to these figures rather more than 40,000 cubic feet of gas are supplied to each individual, but, while the Companies supply 49,000, the authorities only supply 26,000 cubic feet per consumer. We venture to question how far this part of the return is reliable. The number of consumers given appears to be incredibly small, whether compared with the population of the United Kingdom or with the quantity of gas manufactured, which is 9 per cent. more than the quantity sold. The consumers, we are told, are calculated according to the number of accounts. They thus represent families, rather than individuals, a consideration which would make the number of gas users, according to the average number of inhabitants per house, amount to between 11 and 12 millions of persons. But the number is no doubt larger, as the proportion of large houses using gas to small ones not using it must render an average unreliable. The local authorities do far less in the way of public lighting than the companies, the latter providing a public lamp for every 4·4 individuals, the former only one lamp for every 6·4 individuals,—counting them as consumers. The local authorities spent 3,127,047*l.*; paid 951,636*l.* in interest; and made a profit of 359,532*l.*, during the last year. Corresponding returns are not made by the companies.

THE *agenda* paper for the meeting of the Metropolitan Board of Works to be held a few hours after this number of the *Builder* is published, contains the following paragraph in the summary of the Works and General Purposes Committee's Report, viz. :—

"5. Reporting for the information of the Board certain circumstances which have now for the first time come to the knowledge of the Committee with respect to Mr. Hebb, the Assistant Architect, and recommending that Mr. Hebb be called upon to resign."

We notice this paragraph with much astonishment, not unmingled with regret, for we had hoped that, regarding the letters made public last Saturday, such an explanation would have been forthcoming from Mr. Hebb as should have led the Committee to take a less drastic view of the matter than they appear from their recommendation to be inclined to take of it. It is stated, however, that he has been condemned unheard. We confess ourselves surprised that the Committee should have so precipitately resolved upon their recommendation; and if the Board adopts it, after its halting determination merely to censure another official whose conduct, as it appears to us, was far more blameworthy than that which is attributed to Mr. Hebb (so far as we are aware of the charge against him), we shall know what to think of the Board's sense of justice. That Mr. Hebb has been very indiscreet is evident; but it appears to us that the Committee proposes to visit that indiscretion with too severe a punishment, and we hope that the Board will take a more lenient view of the case.

A LONG paper on the subject of theatre construction (which is in everybody's mouth now) was read by Mr. T. L. Watson, on the 12th, before the Architectural Section of the Philosophical Society of Glasgow. In the course of the paper Mr. Watson drew attention to the New York Building Law in regard to theatres, which provides that every theatre shall have one front to the street and a certain amount of free space on either side of the auditorium portion also :—

"Every such building shall have at least one front on the public highway or street, and in such front there shall be suitable means of entrance and exit for the audience. In addition to the aforesaid entrances and exits on the public highway, there shall be reserved for service in case of an emergency, in every and all such buildings, an open space equal to one-eighth of the width of the building, outside to outside measurement, and in no case less than 8 ft. in width in the clear in its narrowest part, on the side not bordering on the street, where said building is located on a corner lot, and on both sides of said building where there is but one frontage on the street or public highway.

"Said open space shall begin on the line of the proscenium wall, and shall extend the full length of the auditorium proper to the wall separating the same from the entrance-lobby or vestibule. A separate and distinct corridor shall continue to the street, from each open space, through such superstructure as may be built on the street side of the auditorium, said corridor to be reduced in width not more than may be required for the thickness of the outer wall forming one side of said corridor. The openings into and out of said corridor shall not be reduced in width more than 3 ft. less than the width of said open space, said openings to be provided with doors or gates opening towards the street."

An event mentioned in the latter portion of the paper may serve as a caution in regard to the "sprinklers" which are now so much recommended for stopping a fire on the stage. It is related that at the Ambigu Theatre in Paris, during the day, one of the scene-shifters made a mistake with the new apparatus for drenching the stage with water in case of fire. Some time before the doors opened the water inundated the ground floor of the theatre and damped the scenery, the ropes, and the new iron curtain. The consequence was that when the actors were on the stage the iron curtain remained immovable, and the performance was delayed half an hour. Mr. Watson accordingly recommends automatic "sprinklers." We should not trust overmuch to these. We have a strong impression that they would fail when wanted as often as not.

WE are glad to find that the inaugura address of the new Lincoln and Merton Professor of Classical Archæology and Art at Oxford has been published in pamphlet form. Prof. Gardner took for his subject, "Classical Archæology, wider and special," and the address has a special value just now, as it affords a sound basis for fixing the relation between classical archæology,—still, so to speak, in its probation,—and those kindred subjects, classical literature and classical history, which are already well established as matters of University teaching. The distinction which Prof. Gardner so clearly establishes between the wider and the special archæology has, no doubt, always been dimly felt, but till now has been inarticulate; and it is because of this mental confusion that much distrust of archæology has arisen. The subject matter of both the wider and the special is the same, but they differ in point of view and method. "The wider archæology takes its start from historical record, and never loses sight of its position as one of the handmaids of history; the narrower and more special archæology claims, and has successfully established, a position as an independent branch of study, with methods and conclusions of its own." Oxford is not likely to neglect the wider view, and she is fortunate in having chosen for her new teacher a scholar who, highly-trained specialist though he is, yet never loses sight of these wider relations.

AT Pompeii the excavators have come upon a fountain decorated with a piece of mosaic of unusually fine workmanship. The fountain is in the form of a niche, on the ceiling of which Venus is represented just at the moment when she issues forth from the sea-shell. A little love-god is also rising from the water, and the goddess holds him by the hand. Beneath this group are a number of Nereids and boys with dolphins. On the shore of the sea two draped female figures are represented: one is standing, the other seated; both make gestures of amazement at the birth of the goddess. Opposite them is another female

figure, and a fourth, between them, turns her back to the spectator. The ground of the whole is blue, with a border of shells. It is reported to be the finest fountain mosaic ever discovered. The house in which it was found has not yet been completely excavated.

IT is proposed to restore St. Nicolas Church, Keyingham, East Yorkshire, at an estimated cost of 1,200*l.* The chancel was recently restored by the Ecclesiastical Commissioners, under the superintendence of Mr. Ewan Christian. It is stated that the nave and aisles have become not only dilapidated, but unsafe through the decay of the beams of the roof. The parish is a purely agricultural one, and an appeal has been made to the inhabitants of the East Riding of Yorkshire for assistance. The spire of the church serves as a landmark in the navigation of the Humber. A sum of 452*l.* has been promised towards the restoration.

WE are informed that the wooden doorway and hood formerly at Fairfax House, Putney,—a very pretty specimen of seventeenth-century design,—has been purchased by Mr. Seymour Lucas, A.R.A., who proposes to erect it in front of his house, New Place, Woodchurch-road, Hampstead. We gave an illustration of the house in our last volume, and a detail of the staircase [vol. lii., p. 263], and some further notes and sketches by Mr. J. Afred Jones [p. 517].

THE Disney Professor at Cambridge (the Rev. G. F. Browne, B.D.) proposes to deliver six lectures on Tuesdays, January 31 to March 6, at 2·30 p.m.; the first lecture in the Senate House, the remaining five at the Museum of Archæology, on the interesting subject of the Sculptured Stones of pre-Norman type in the British Islands. The subjects and lectures will be arranged under the following heads:—1, General Survey, Jan. 31; 2, Anglian Stones,—dated examples, Feb. 7; 3, Anglian Stones,—undated examples, Feb. 14; 4, Anglian Stones,—Runic and other Inscriptions, Feb. 21; 5, Anglian Stones,—the Christian Story and the Sagas, Feb. 28; 6, Anglian Stones,—Connexion with Rome, Ravenna, &c., March 6.

THE Winter Exhibition of the Society of Painters in Water Colours contains a number of beautiful things, pre-eminent among which is Mrs. Allingham's one contribution, "East and West" (174), a seaside scene where a beautiful English lady is seated in the foreground reading a letter from her husband in India, while her child with the Indian nurse is seen a little way off. As usual in Mrs. Allingham's works, the little bit of story in the picture is completely told, and the face of the principal figure is lovely. The whole represents the artist's highest style of work. Perhaps the work which will strike visitors most, next to this, is Mr. A. Goodwin's "Gate of Zoar" (198), a kind of sequel to a former picture. It represents the destruction of the Cities of the Plain, seen from a distance, a red rain descending from an awful and portentous mass of almost solid-looking sulphurous cloud. This kind of effort at imagining something beyond nature is a dangerous direction for an artist to wander into; the thing is very powerfully done, but it is not the kind of subject one would like to see very much of, even from an artist of Mr. Goodwin's imaginative power. Among the works which are really "sketches and studies" are some by Sir Oswald Brierley, and a frame of "Six Album Sketches" (121) by Mr. Walter Field; but most of the drawings, as usual, are as finished as those to be found in the Spring Exhibition. Mr. A. Goodwin sends a series of charming views of English towns,—Rochester, Worcester, Bristol, and others,—which bid fair to rival Turner's vignette illustrations of localities. We have only the fault to find of want of force in the one giving "Bristol," which is taken at the docks with the bow of a ship in the foreground; but it is a little too polished up for the subject: no one ever saw Bristol look as clean and bright as in that picture. Mr. Alfred Hunt is a rather larger contributor than usual, and seems to be specially studying contrasts of the same scene under different lights; "Whitby" in morning and evening, for instance (85 and 127); "Robin Hood's Bay, Showery Evening" (35, a very fine work); and "Robin Hood's Bay, Afternoon" (163). Among others who are well represented is Mr. Cuthbert Rigby, whose "Early Morning, Beeley, Derbyshire" (34), is one of the freshest and brightest bits of morning effect we have ever seen in a drawing. Mr. H. S. Marks has several interesting figure studies marked by his peculiar humour; the best, perhaps, is that of the cynical old gentleman reading "A French Novel" (47); the Puritan "Secretary" (183), sealing a letter, with a face of business-like decision, is also very good; and there is a very delicate humour in the two entitled "Sunshine" and "Rain" (29 and 36), the same figure at the door of a house looking outward in the one and inward in the other,—a kind of reminiscence of the old form of weather foreteller with figures that move out and in. Mr. Naftel's works are exceedingly good, especially "On the Beach, Studland" (135). Mr. Herbert Marshall has visited "Fowey" (53) with good results. Mr. R. W. Allan's drawings of towns have force and originality of style, but tend to exaggeration: in "Middelburg" (62) the shadow on one side of the street seems like some solid substance laid down on the roadway. Mr. Tom Lloyd's "Anxious Mother" (84) is one of his prettiest if not one of his finest works. In a drawing called "Lawn Tennis" (112), Mr. C. Robertson gives a foreground study of a profusion of flowers, brilliant, but as hard as if they were cut out in steel. Mr. G. H. Andrews's "Bad Weather in the North Sea" (133) is a large and rather remarkable study of a ship in a gale of wind; but the surface of the water is not "watery," though the tumultuous movement of it is well suggested. In "No Customers" (150), Mr. Arthur Hopkins gives a very highly-finished study of vegetables and green-grocery miscellanea, which is really a triumph in its way. A considerable number of the late Mr. Collingwood Smith's works are hung at the lower end of the room.

THE citizens of the "Burgh of Newport, Fife," seem to be an unco' canny set of people (in their own estimation, at any rate), if we may judge from an official advertisement which appeared in the *Dundee Courier* last week. The advertisement is question, signed "Thos. Congleton, Clerk to the Commissioners of the Burgh of Newport," sets forth that "the Commissioners invite competitive drainage schemes for the burgh, with relative plans, and offer a premium of 20*l.* for the scheme with plan adjudged best, and 10*l.* for the second best, as these may be awarded by such person or persons of skill and experience as the Commissioners shall appoint, but only on the conditions following, viz.:—That the schemes and plans for which the premiums are awarded shall become the absolute property of the Commissioners, who shall have right to carry out same, in whole or in part, without employing the successful competitors, or any of them, or being liable to them, or any of them, in any fee, commission, or charges, in connexion therewith, or with the work done or otherwise." Even assuming that the "Burgh of Newport" is as small a place as the "premiums" offered are insignificant, and that consequently only a small scheme of drainage is required, the Commissioners ought to be told, by "such person or persons of skill and experience" as they say they propose to "appoint," that they cannot reasonably expect engineers of capacity and experience to compete. The smallness of the premiums offered is only equalled by the comprehensiveness of the "conditions following." We cannot imagine that any self-respecting civil engineer will respond to this invitation. Possibly a few tyros and people who are not engineers at all may compete, with the result that the Burgh Commissioners may find that, through being "owre canny," they have got a system of "drainage" with the levels all wrong and the falls all inclined upwards! Such things have happened before now under similar conditions, and they have tended neither to economy nor healthfulness.

THE ROYAL ACADEMY STUDENTS' DESIGNS.

THE designs submitted by the students for the various prizes given by the Royal Academy were publicly exhibited at Burlington House on Monday and Tuesday last. The innovation of allowing the exhibition for two days instead of one only, as before, is an improvement which might be extended further, even to exhibiting them for a week: many would be glad to look at them if more time were allowed.

The following is the list of subjects and prize winners:—

Historical Painting: "Captives."—Gold medal and travelling studentship (200*l.*), Arthur Trevethin Nowell.

Landscape Painting: "Sunset after a Storm."—Turner gold medal and studentship (50*l.*), Arthur Trevethin Nowell.

Landscape Painting: "An Old Water Mill."—Creswick prize (30*l.*), Stephen Briggs Carlill.

Painting of a Figure from the Life.—Silver medal, 1st, not awarded; silver medal, 2nd, William Farran Littler.

Painting of a Head from the Life.—Silver medal, 1st, Minnie Jane Shubrook; silver medal, 2nd, Maud Porter.

Copy of an Oil Painting: "Man in Armour," by Van Dyck.—Silver medal, 1st, Arthur Claude Cooke; silver medal, 2nd, Thomas Henry Jones.

Copy of a Landscape: "The Lock," by John Constable, R.A.—Silver medal, not awarded.

Cartoon of a Draped Figure: "Demosthenes on the Sea Shore."—Silver medal and prize (25*l.*), Alfred Bernard Sykes.

Design in Monochrome for a Figure Picture: "John and Jezebel."—2 Kings ix. 30-33.—Armitage prizes, 1st (30*l.*) and bronze medal, William Farran Littler; 2nd (10*l.*), Walter Stanley Paget.

Design for the Decoration of a Portion of a Public Building: "Summer." — Prize (40*l.*), Wm. Ernest Reynold Stephens.

Drawing of a Figure from the Life.—Silver medal, 1st, not awarded; silver medal, 2nd, Herbert James Draper.

Set of Six Drawings of a Figure from the Life.—1st prize (50*l.*), Chas. Thos. Rudkin; 2nd prize (25*l.*), Stephen Briggs Carlill; 3rd prize (15*l.*), William Farran Littler; 4th prize (10*l.*), Percy Short.

Drawing of a Head from the Life.—Silver medal, 1st, Joseph Walter West; silver medal, 2nd, Mary Catherine Abercrombie.

Drawing of a Statue or Group.—The two silver medals for this were not awarded.

Drawing of a Statue or Group.—Prize (10*l.*), Lydia Bacon King.

Perspective Drawing in Outline (open to Painters and Sculptors only): "The Exterior of St. Paul's Church, Covent-garden."—Silver medal, Edith A. Cooper.

Line Engraving of a Drawing of a Figure from the Life.—No competition took place for the Gold medal and prize (25*l.*) given for this subject.

Composition in Sculpture: "An Act of Mercy."—Gold medal and travelling studentship (200*l.*), George Jas. Frampton.

Set of Three Models of a Figure from the Life.—1st prize (50*l.*), Wm. Goscombe John; 2nd prize (20*l.*), Wm. Ernest Reynold Stephens.

Model of a Design: "An Episode of the Deluge."—1st prize (30*l.*), Wm. Goscombe John; 2nd prize (10*l.*), Arthur George Walker.*

Design for a Medal: "A Prize Medal for a School of Art."—Silver medal, not awarded.

Model of a Figure from the Life.—Silver medal, 1st, John Rollins; silver medal, 2nd, Jas. Nesfield Forsyth.

Model of a Statue or Group.—Silver medal, 1st, Andrea C. Lucchesi; silver medal, 2nd, Chas. John Allen.

Model of a Statue or Group.—Prize (10*l.*), Wm. Henry Prosser.

Design in Architecture: "A Railway Terminus."—Gold medal and travelling studentship (200*l.*), Robert Weir Schultz.

Set of Architectural Drawings: "St. George's Church, Bloomsbury."—Silver medal, 1st, Percy Norman Gingham; silver medal, 2nd. * * * *

Set of Architectural Designs (Upper School).—Prize (25*l.*), William Leck.

Set of Drawings of an Architectural Design (Lower School).—Prize (10*l.*), William Alford.

Perspective Drawings in Outline (open to Architects only): "The Caryatide Portico of the Erechtheum."—No competition took place for the silver medal given for this subject.

The Landseer Scholarships in Painting and Sculpture, of 40*l.* a year each, tenable for two years, given for the best work done in the examination for passing into the Second Term of Studentship, have been awarded:—in *Painting*, to Ernest W. Appleby and Herbert James Draper; in *Sculpture*, to William Goscombe John and William Ernest Reynold Stephens.

In Architecture, the Gold Medal and Travelling Studentship, for a design for a railway station, has been awarded to a very clever and original design by Mr. R. Weir Schultz, the only one of these designs which travels much out of the beaten track of railway station architecture. The author has evidently set himself to consider fairly how a railway station can be expressed in architecture in a simple, suitable, and unpretending manner, discarding conventional architectural ornamentation and adopting a simple and bold treatment with little ornament; and what little there is has a definite meaning. The main portion of the end of the building is treated with a great gable with massive piers at the angles of the building,

* Disqualified, owing to having received the same prize in 1885.

and a great semicircular window; the general idea is that of King's Cross improved upon. It is a pity that the author has stuck to the old system of dividing up his semicircular window with four perpendicular mullions cutting into the circle,—the worst way of dividing up a circular window, but one sanctioned by long habit. Over the keystone of the window a large clock is corbelled out, with a gablet over it, and flanked by basrelief figures of Day and Night. The offices form a long low block running across the front, with a gateway in the centre with a deeply-recessed arch with carved soffit, the whole centre entrance forming a solid mass of masonry treated with a quasi-Doric cornice and an attic over, in which are medallion alto-relief portraits of Brunel, Watt, and Stephenson. The range of offices on either side is treated with what may be called a Tuscan order in which the entasis of the columns is a good deal overdone: this portion might be improved in detail. The author has reproduced the figures from the Temple of the Winds over his central entrance, which is also flanked by two figures of lions on pedestals on either side. As a whole, the design shows originality and thought, and is decidedly the best of the set, though not so taking or effective in mere drawing as some others.

No. 331 is a design of considerable merit, more decidedly Classic in detail. The whole rests on a high rusticated podium, which runs all round the building, over which in front is a screen wall with an Ionic order, stopped by angle pavilions at either end; but as the author has used his Ionic columns rightly, *not* as angle columns, but as columns in a range terminating in piers or *antæ*, why did he in his entrance pavilions use the corrupt form of the Ionic column with the volutes at an angle of 45°? Are not students at the Royal Academy taught that this form is only a corruption invented to facilitate the use of the Ionic column in all positions? Whereas the true form with the flat volutes was meant to be used exactly in the kind of position in which the author has the order here; so that he has thrown away his opportunities in this detail. There is a prettily designed clock tower on the left; but a defect of the design is that the effect of the large semicircular window at the end of the main building is lost, as only a little bit of the curve appears above the screen range in front. The author has suggested that he is up with the times by labelling his design "electric railway terminus." No. 332 has a good idea in his front, with the deeply-recessed arch round the great window carried down to the ground in front; but unfortunately the plan shows that this bold front composition has no reference to what is in the rear of it. No. 333 shows the iron roof with no screen, between two towers, which are kept as solid masses below, with elegant cupolas above; but the design of the lower buildings in front is fragmentary, and seems to have no relation to the whole. No. 336 has placed a hotel block in front of the station, falling back in an elliptical recess in the centre, the lower portion of the recess containing a top-lighted waiting-hall, the outer line of which projects, and completes the ellipse. This is an idea, but not a good one; it weakens the centre, and is of little practical advantage on plan. No. 337 takes somewhat the same leading idea as the prize design, but with less refinement of feeling, and more pretentious detail; and the same may be said of No. 338, which is the better one, however, and the perspective drawing is a very good and effective one.

The elevation by Mr. Leck of a London street front, to which the prize of 25*l.* has been awarded, is a picturesque design with some good bits of detail about it, and a corbelled out angle bay which develops into a circular lunette above with some pretty decorative treatment. The semicircular-headed windows on the first floor are here again divided by the upright mullions cutting into the circle, which, to our eye at least, are so disagreeable. No. 352, a coloured elevation of a design of somewhat the same type, has a good deal of merit; so has No. 350, but it is spoiled by the ugly scrolls standing out on the slopes of the gablets. Among various designs for "a monumental fountain," most of which are not very successful, the best, perhaps, is one in a style we have little sympathy with, No. 345, a Roman one with an architectural background, showing a heavy rusticated Doric order, the details well put in. Most of the designers have attempted to make the fountain too much of an architectural erection with a fountain attached to it, rather than a fountain pure and simple.

The sketches abroad by the Travelling Student for 1886 (Mr. Maclaren) are in every way to his credit, in number, choice of subjects, and execution. They comprise pencil sketches and a good many studies of coloured detail. The pencil sketches in England by the Travelling Student of 1887 (Mr. E. H. Sedding) are more slight, but very good of their kind.

Perspective, which is illustrated in the same room, does not seem to be an attractive subject to Academy students; only two or three seem to have gone in for it; the prize has gone to a lady for a drawing of St. Paul's, Covent-garden (the subject set, apparently), which does not strike us as a very successful effort. Only one competitor, apparently, has appeared for the prize for measured drawings; the drawings of St. George's, Bloomsbury, which he has submitted, are clear and complete, not very finished in execution, but showing the facts well.

The prize for the sculpture composition, the subject being "An Act of Mercy," has been rightly awarded to Mr. Frampton for a very well-modelled and expressive group of a young girl giving water to a prisoner who is bound. The contrast between the youthful figure of the girl and the wrinkled and haggard expression of the captive is finely felt, and the whole is a well-modelled and well-composed group. Among the other designs submitted we may mention No. 292, a wounded soldier tended by a man and woman, and 293, a large group of the Angel of Death releasing the captive; the recumbent figure of the dying man is a fine one, and there is a noble conception in the work.

Of the designs for a tempera painting for wall decoration,—subject, "Summer,"—the one selected for the prize is the only one that is really and in the full sense decorative work, and therefore the award cannot well be questioned; but the composition is not very interesting: it is a kind of echo of Mr. Albert Moore, and represents some listless young women with no particular expression, lying about on a marble seat in various attitudes of *dolce far niente* enjoyment. We cannot care for such a work; decorative painting on a large scale is, or should be, an opportunity for realising a great idea; here there is little or no idea to speak of: still, the group is well designed for its purpose as far as effect and manner of treatment are concerned. No. 157, a Florentine scene of the Renaissance time, has merit of the same kind; and No. 156, a rustic scene, is good as a picture, and the single figure cartoon is a very nice one, but the composition fails in a decorative point of view from want of massing of the figures; the outline of the group being ragged, so to speak, two figures standing up above the rest at two points, and then a great gap between them. It is one desideratum in decorative figure painting, as in decorative basrelief, that the group of figures should fill the space pretty evenly, and harmonise with the lines of architectural composition and construction. In this respect the prize design is a success, and most of the others are not.

The subject for the cartoon study of a draped figure is Demosthenes practising his voice on the sea-shore; and here the cartoon to which the prize is awarded at first strikes one as by no means the best; it is theatrical in effect, and, to our thinking, not so well drawn as one or two of the others. But it has the merit of being a *bonâ-fide* attempt to realise the subject. The other figures merely represent a man posed in a certain attitude, with his drapery blown about by the wind; one competitor has hit on an original treatment in showing us Demosthenes with his back to us facing the sea, which forms an element in the drawing. There is something to be said for this way of treating the subject, in the way of dramatic and picturesque effect; but it is not treated so as to make the most of the expressive action of the figure whose face is hidden from us. In Mr. Sykes's figure there is no "posing." Demosthenes is in full shout against the noise of the sea, with his mouth wide open, in the evident exercise of great exertion; that is a realisation of the subject; the others are not.

Having looked at the architectural drawings first, we are going backwards through the collection, and come now to the two rooms of oil-paintings, which are hung first in order in the rooms. The paintings for the Turner Medal are a curious collection. It seems to be an understood thing with the competitors that they are to be Turneresque or nothing, and the attempts to give sunset *à la* Turner result in the most tremendous displays of crimson and yellow, alarming to contemplate. The prize work by Mr. A. T. Nowell (who has also gained the prize in historical painting) is far away the best, and, in fact, has hardly any rival among the others, and it is free from the sensational colouring which characterises so many of the others. There are one or two that deserve note, however; No. 25 shows a fine study of sunlit clouds, and No. 30 an effect of clear light and open sky over a dark hill, which is certainly fine, though the author has not quite accomplished what he aimed at. In regard to the historical paintings we feel a little doubtful about the verdict. The prize painting (subject, "Captives") represents a scene where a young man, clad in a leopard skin, is bound to a tree, and a young woman in the foreground is being bound by a soldier and a monk. The subject suggests the story of Laon and Cythna in the "Revolt of Islam"; we know not whether this was the intention. The woman, who throws herself forward with outstretched arms towards her companion in affliction, stretches out a most tremendous length of right-leg behind her into the foreground, reminding one of the style of Fuseli's figures; we should like to see Mr. Harry Furniss's version of that figure; it would not leave him much room, however, for "happy exaggeration." There is some good painting in the picture, but it is too sensational, and we were disposed to think there were finer qualities in the painting numbered 5, with the old captive Gaul sitting in the foreground and the Roman soldiers looking on. The best after this, perhaps, was the modern treatment of the subject, the handcuffed "Captive" in a railway carriage; but it makes a very disagreeable picture.

The exhibition of the designs was largely attended, and seemed to attract a good deal of public interest.

THE SPHERE IN PERSPECTIVE.

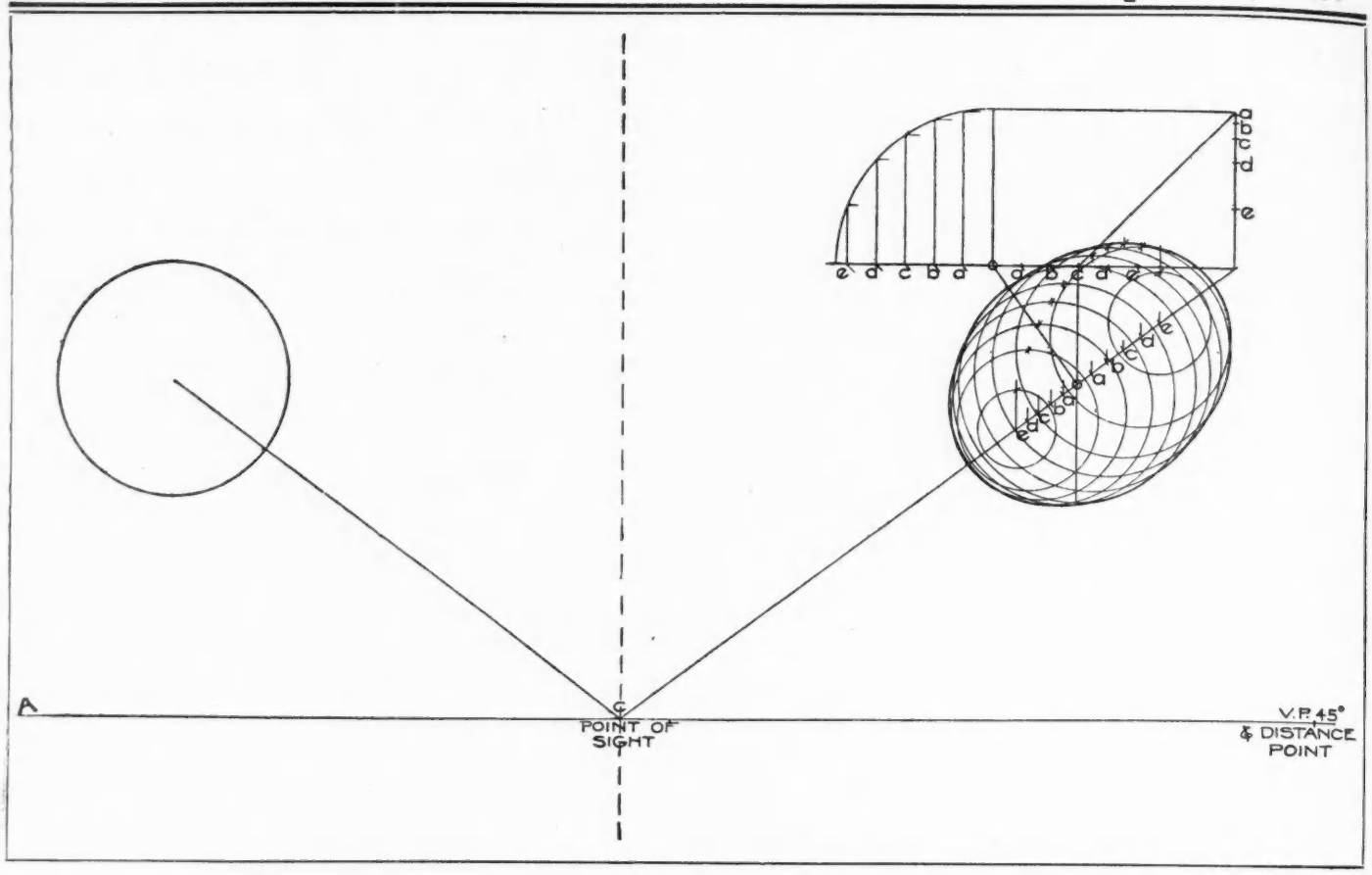
The following letter and diagram forwarded by Mr. R. Phené Spiers arose out of our remarks on a passage in his book on "Architectural Drawing" (p. 762, *ante*), and will be of interest to many of our readers, though it will be seen that practically Mr. Spiers's view does not differ much from ours: —

Sir,—I am obliged to you not only for your favourable notice of my work on "Architectural Drawing," but for the opportunity you give me of explaining more clearly the objects I had in view in referring to the projections of spheres in perspective.

The paragraph you have quoted must be taken in context with the previous paragraphs, and then, I think, will not seem so strange.

If I understand your question rightly, you do not take exception to the actual fact, viz., that the sphere can only be mathematically represented as a circle when its centre is on the point of sight, but to its application in the making of perspective drawings.* In that case I am in accord with you, and the illustration I enclose will, I think, more fully explain my meaning. I have in this illustration drawn a sphere on the left, as I consider it always should be drawn (with one exception, which I will refer to later on), and on the right a sphere projected, as regards its main form, mathematically; as regards its outline approximately only because I have desired to show the method by which I arrived at its projection. I have assumed the sphere to be intersected by a number of vertical planes (parallel with the picture plane for convenience of projection), and I have put in perspective each section of the sphere. This shows as a matter of fact that if projected mathematically the sphere becomes an ellipse when not on the point of sight. In the illustration, A B is the horizontal line, C the point of sight, and C D represents the distance of the spectator from the picture plane. Now if this drawing be held at a distance, C D, from the eye the projection on the right should appear circular, that on the left elliptical; I say *should*, because it happens unfortunately in this particular instance, having taken a distance point too close to the picture plane, and a sphere too much out of the range of vision, the

* That was our meaning.—Ed.



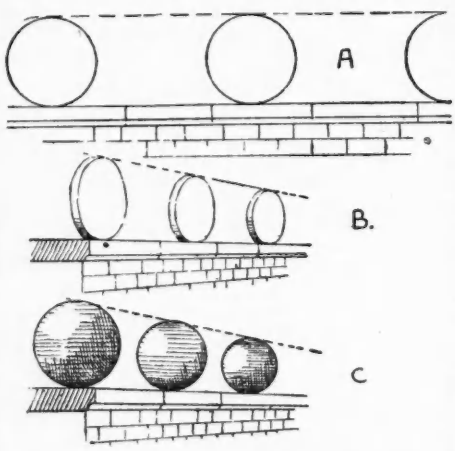
eye is unable to embrace the point of sight and the sphere at the same time; and therefore it is necessary to look askance to see the sphere, thereby changing position of the picture plane; but even looking askance at the projection I have given of the sphere, if the drawing be brought to within about two-thirds of the distance C D, it will be seen that the figure on the right has the appearance of being circular, whilst that on the left looks elliptical. It follows, therefore (and this was the exception I desired to make) that if a drawing is being prepared which will always be seen from one point of view (as in a peep-show, for instance) it is necessary to take cognisance of the fact and project the various features exactly, even although in its preparation the spheres should come out as ellipses. It also suggests to the draughtsman: firstly, the great importance of selecting his point of view so as to avoid great distortion (in the drawing of a dome or circular vase, for instance, to make it come, if possible, on the vertical plane intersecting the picture plane in the point of sight); and, secondly, the invariable necessity there will always be of "cooking" or correcting certain features, because the representation of a building on a vertical plane is not always the way in which the building might actually be viewed except at a long distance off, and also because the drawing will not necessarily be looked at from the point of view from which it is actually drawn. This explanation will, I hope, serve to place the subject in a clearer light before your readers.

R. Phené Spiers.

Carlton Chambers, 12, *Regent-street*.

N.B.—There is one other passage in your notice which I should be glad to refer to, viz., the use of drawings in France with the shadows projected at 45°. They are not sent to the contractor as working drawings, but used only for the purposes of study; in fact, they take the place of our perspective drawings, and guide the architect in his design, whilst they serve also as competition or exhibition drawings. As a rule, the French do not make perspective drawings, and their architecture, I think, loses in consequence.

*** There is another point, however, in regard to the theoretical distortion of the sphere in a perspective drawing, which we have not seen alluded to, and which suggests the idea that after all there is a screw loose in the theory of perspective, as set forth by those whom we may here call the "distortioners." When drawing circles in perspective, which appear on the paper as ellipses, we are not merely concerning ourselves with projection on the plane of the drawing; we are drawing them as we see them. Let A represent a geometrical elevation of three circular bodies, either circular discs or spheres, placed in succession on any level base, such as the top of a wall. In the geometrical elevation, their outlines, whether they are spheres or discs, will alike be circles. Move to one side so as to



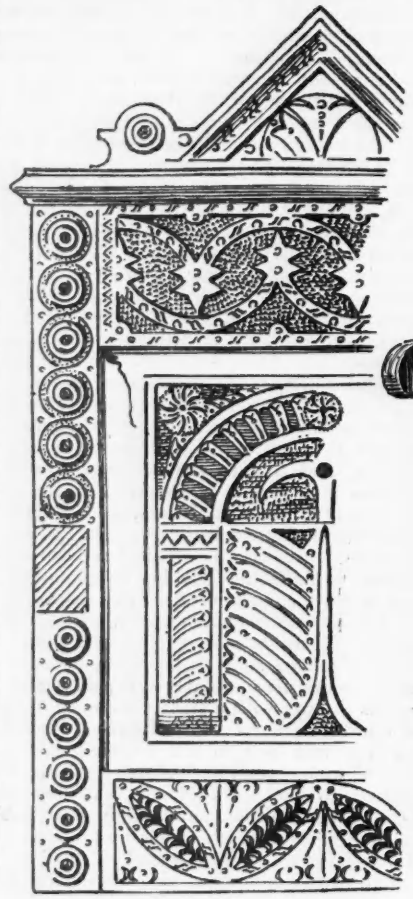
take them in perspective, and if they are discs, we shall see them, as at B, as a series of ellipses; observe, we do not merely draw them or project them so, but we *see* them so, as may be practically proved by holding up a divided scale at a fixed distance between the eye and the object, and measuring its apparent length and breadth by the scale. But if the three objects are spheres, when we take them in perspective they are spheres still,—their apparent outline and perspective are perfectly unaltered, and they appear as at C. It is true that we do not see actually the same horizon-line on any of them that we saw when we were in front, and the horizon-line of each sphere is, in the case of C, in a different plane in reference to the base-line on which the spheres are standing; but we see them all as true spheres just the same as before.

Whereupon we put two questions:—(1) Is there not something illogical in a system whereby we are to draw circles in perspective as we actually see them in fact, and spheres as we never see and could not see them? And (2) Would any painter who had to introduce a spherical object into a picture,—say, a globular termination to a gate-pier,—venture to draw it in an elliptical and distorted form because it was on one side of his picture and out of the line of sight?

SIR F. LEIGHTON ON THE ARTISTS OF THE RENAISSANCE.

The following is a portion of the address delivered by the President of the Royal Academy at the distribation of prizes to the students on Saturday last:—"The production, both in sculpture and painting, of the middle period of the thirteenth century has a character of transition. In painting, the works, for instance, of Cimabue and of Duccio are still impregnated with the Byzantine spirit, and occasionally reveal startling reminiscences of classic dignity and power to which justice is not, I think, sufficiently rendered. In sculpture, the handiwork of Nicolo Pisano is full of the amplitude, the rhythm, and virility of classic art. I see in it, indeed, the tokens of a new life in art, but little sign of a new artistic form,—it is not a dawn; it is an after-glow, strange, belated, and solemn. In the art of Giotto and the Giottesques the transformation is fulfilled. It is an art lit up with the spirit of St. Francis, warm with Christian love, pure with Christian purity, simple with Christian humility; it is the fit language of a pious race endowed with an exquisite instinct of the expressiveness of form, as form, but untrained as yet in the knowledge of the concrete facts of the outer world; an art fresh with the dew and tenderness of youth, and yet showing, together with this virginal quality of young life, a simple forcefulness prophetic of the power of its riper day. Within the outline of these general characteristics individuality found sufficient scope. Awe of the doom of the wicked and a sense of inexorable retribution inspired in minds of a certain stamp works full of a Dantesque severity and force; to others militant Christianity and theological allegory furnished a grateful field. Local particularities of temperament were reflected in local artistic production; in the work of the Florentines we trace that grave sobriety which so strongly marked them in the early days of their republican freedom, and of which, later on, Pandolfini was to draw an interesting picture. Among the Siennese, on the other hand, the love of splendour and luxury peculiar to them translated itself in the gay profusion of gold ornaments which, in their pictures, bespangled and enriched the gorgeous raiment of their virgins, saints, and angels. The main external characteristics of this early phase of art, however, are, I repeat, a keen sense of the expressiveness of form, which translates itself in beauty and flow of line, ignorance of the facts of nature resulting in drawing empty as well as inaccurate, and, we must add, a com-

plete indifference to landscape, with which, in fact, it deals symbolically rather than by imitation. Soon, however, the agencies which were at work in the world of general culture made themselves felt also in art. You will remember that I pointed out to you a two-fold current in the intellectual evolution. On the one hand, a reaction against the fetters of monkish rule and the doctrine of the inherent depravity of humanity, together with a growing interest in man and in the phenomena of Nature; and, on the other, an ever-increasing interest in the achievements of the pre-Christian ages, and especially the age of the supremacy of Rome. Now these two agencies merged to a great extent one into the other in the general intellectual movement; but in Art, at least in the arts of painting and sculpture, for some lapse of time only one of them made itself felt, —to their great gain,—namely, the impulse to study man and the world he inhabits; the impulse, in fact, to study Nature. The humanists, in their almost superstitious reverence for the masterpieces of classic literature, were pursued by the temptation to repeat, like parrots, words which clothed ideas not their own, and expressions which corresponded to nothing in their minds. The artists were more fortunate; of ancient painting nothing, of ancient sculpture little only, was before them; and after the date of Nicolo Pisano that little seems for a considerable period to have exercised small influence on them. And so it happened that while men of letters were thrown into the pursuit of knowledge which they found clothed in a perfect artistic form at a time when their heads were, so to speak, hardly strong enough to carry the intoxicating draught, artists, unhampered by the crushing example of a past perfection, were flung straight on to the bosom of Nature,—where safety is. Other circumstances also helped to shape their course. One of the most distinctive features in the economy of the Italian Republics was the free and unchecked development of the individual. The age was one in which every individual was gauged exactly according to his intrinsic worth; every capable man got the full value of his capability; to every capable man all things were open. Accordingly, the study of the individual forced itself upon the artist, and the acuteness of observation, which was innate in the Tuscans, became manifest in a marvellous subtlety in the rendering of individual character. Such portraits as those of Mellini and Palmieri, the medals of Pisanello, and the frescos of Masaccio and Ghirlandajo will at once occur to you. Whether they use the pen, the pencil, or the chisel, the Florentines of the Renaissance are unsurpassed in their vivid portrayal of individual men. In its turn the scientific spirit took possession of the Arts. The once forbidden, now frequent, representation of the nude human form led to a desire for the knowledge of its marvellous mechanism and its secret structure. Anatomy, accordingly, was pursued with zeal. Perspective, too, was keenly studied: a science especially indispensable to men whose love of architecture as an adjunct to figures amounted almost to a passion, and was, no doubt, in great measure, the outcome of the haunting impression of architectural grandeur produced in them by the sight or by the accounts that reached them of the stupendous ruins of ancient Rome. And in the train of perspective the cognate mysteries of foreshortening claimed their votaries and exercised a fascination, of which, indeed, the results were sometimes not a little ludicrous. The prophet of foreshortening was Paolo Uccello. There is in Florence, among other works of his that might be described to much the same effect, a battle-piece, in which a strictly foreshortened warrior and his charger, foreshortened for the last time, for they lie stark and dead in the forefront of the canvas and the fight, a horse kicking the spectator, and a pile of lances disposed upon the ground, with unblushing intent to display the artist's science, have an altogether comic effect. By the side of this scientific fever the joy in re-discovered Nature manifested itself in a new delight in landscape. The summary indication of earth and vegetation which sufficed to the school of Giotto soon gave way to an almost undisciplined exuberance of treatment. Who does not remember the riot of hill and dale, of tree and shrub, of vineyard and pleasaunce, of birds and beasts, in which, on certain walls of the Campo Santo of Pisa, Gozzoli, for instance, celebrated the joyous spectacle of the world? And when to this spirit of simple gladness is added the spirit of science of which I have spoken, we get such amazing studies of leaf and flower as Leonardo loved to draw. Thus to Tuscan artists the new movement brought the love of nature and the light of science. I have said that the revived classicism for some considerable period affected but little the outer form of their art. It did, however, at an early date largely modify the subject matter with which artists dealt. Mythology had laid a powerful hold on the humanists. The objects of Pagan and of Christian worship were mixed in a strange promiscuity within their minds. The attributes of heathen gods were given to the Almighty, of whom they loved to speak as Jupiter Altitonans, high-thundering Jove. But over the arlists also the heathen fables cast their spell; gods and goddesses, satyrs and fauns, dryads and nereids invaded their fancies and once again impelled their hands; and Pagan myths took their place in the studio by the side of Christian verities, objects of equal homage. You foresee, however, that under Tuscan pencils these pagan themes will assume a thoroughly changed complexion; and it may be interesting to compare, in passing, one with another, by a special instance, the treatment of kindred subjects by a Florentine painter and a Florentine poet. Some portions of the famous picture of "Spring," by Botticelli, in the Gallery of the Belle Arti in Florence, recall certain stanzas in the "Giostra" of Poliziano so vividly as to suggest that the painter must have had them in his mind when he conceived the picture. Yet, see how wholly different they are in the order of emotion they evoke! How luminously joyous, how serenely sweet, and, in this sense, how classic is the sentiment exhaled from the music of Politian's lines! How full of twilight and of subdued strange sadness is this loveliest of Botticelli's works! The matter is classic, the spirit modern and Christian. The Renaissance has laid a stronger grip on the poet than on the painter. But, as is natural, the action of this complex movement on artistic development varied in its conflict with the Mediæval spirit according to the human stuff on which it worked. Before the close of the fourteenth century the exclusively religious and didactic phase of art had spent itself. The days were past when the doctrines of the Faith, its comfort and its terrors, the science of government, and the precepts of morality, spoke to the masses, in unripe but lofty artistic language, from the walls of church and council chamber. Giotto had clothed in forms of art the spirit of St. Francis, and had gone to the grave. Simone Memmi, the champion of militant orthodoxy, hot with the fire of St. Dominic, and the far greater painter Ambrogio Lorenzetti, whose solemn frescos in the Communal Palace of Siena are a great sermon on the virtues which build up a well-ordered State, both these had ceased to live; and now a period had begun in which worldly subjects and classic mythology were to invade Art; a period in which it lost for a time much of its ethical elevation, but during which the nourishing elements of knowledge were being eagerly absorbed and assimilated, which alone could equip it for its final and its highest triumphs. Yet even when the flood-tide to which Petrarch had opened the gates of Mediæval civilisation was, as it seemed, sweeping everything before it, the old flame of religious fervour was not everywhere spent. Even in the middle of the fifteenth century you might, turning aside from the turmoil of the streets of Florence, have seen, in his silent cell, a pious monk, absorbed in his work, catching no echo of the outer din, gazing with rapt eyes on a world of love and ecstacy, the radiant creation of his own pure and reverent soul. And if the ecstatic spirit survived in Beato Angelico alone, perhaps, in this undimmed serenity, the graver spirit of religion, the Christian sadness, still touched and tinged the mind of a Signorelli, a Botticelli, a Perugino; cast a tender light over the first youth of Raffaelle Sanzio, and at last found its fullest expression in the sublime creations and its saddest cry in the rugged sonnets of Michelangelo Buonarotti. But, perhaps, the various operation in the province of art of the two main motive forces of the Renaissance,—the impulse towards the scientific study of nature and the impulse to reinstate the classic spirit,—may be best illustrated by more special reference to the work of three typical artists whom I have already named,—Leonardo da Vinci, Raffaelle, and Michelangelo. Of the scientific impulse we see the fullest expansion in that miracle of many-sidedness,—Leonardo. A never-sated hunger for knowledge in every form, a desire ever burning to lift up the veil from every secret of Creation, possessed and marked him through life. The hidden structure of the bodies of men and of animals, the structure of plants, the ways of rushing waters and of wandering winds, and every riddle in the book of Nature, were objects of his ardent curiosity and unwearied study. How far beyond the horizon of his day his prescient spirit carried him along the fields of science in which art is not involved, others, better than I, can tell you. But we cannot, in this strange man, separate the scientific investigator from the artist. In his moody and fitful spirit, unrestingly straining forward in the quest of some intangible new perfection, it was the same haunting sense of mysteries unsolved that led him, now towards scientific prophecy, and now to the creation of a type of human beauty more subtle and complex than any the world had seen before. The influence of the revival of classicism, both in its spirit and as a form of æsthetic expression, is seen at its meridion in Raffaelle. To him the knowledge of such masterpieces of ancient sculpture as were brought again to the light in his day came when his precocious gifts were already about to reach maturity; and their example found a fruitful soil in his singularly well-poised genius, filled as it was with a stately sense of beauty and chastened by a mind of rare refinement. Whatever was best in the classic spirit was absorbed and eagerly assimilated by him, and imparted to the work of his best day that rhythm, that gentle gravity, and that noble plenitude of form which are its stamp, and proclaim the brother of Mozart and of Sophocles. In these two artists, then, we see the afflatus of the Renaissance in two distinct forms,—in its avidity of research with Leonardo, in its classic serenity with Raffaelle. It remains for me to speak of one, the greatest, far, of all, on whom, as an artist, the old world had no direct hold or influence, though it coloured his intellect by blending into his Christian orthodoxy some tinge of that Platonic mysticism which, since Marsilio Ticino first taught it, had fascinated the choicest spirits of the age. I speak, of course, of Michelangelo. His contact with the Renaissance as an artist is traceable only in the scientific spirit and its interest in man; for to the artist Michelangelo, who saw in the human form a dim reflection of the Divine beauty, man was the all-absorbing and exclusive object of study. All else was indifferent to him; to him a plain mass of green or gray sufficiently signifies the earth. Only once, and because the subject,—the temptation of Eve,—demands it, does a melancholy-looking trunk, with a few leaves, intrude into his work to represent the green glory of the forest. Giotto himself is not more scornful of its charms. And this I wish you to note of Michelangelo as distinguishing him from Raffaelle,—the type of human form which he lifted to the fullest expressional force is the last development of a purely indigenous conception of human beauty, whereas the type which we know as Raffaellesque is a Classic ideal warmed with Christian feeling. Sublimely alone as Buonarotti's genius stands, towering and unapproached, like some unscaled, heaven-ward, mountain peak, it does but mark the highest summit reached, in the magnificent continuity of its evolution, by the purely native genius of Tuscan art. Reaping, with full hands, all the knowledge of his day, and conscious of its worth, Michelangelo flung that knowledge as fuel into the furnace of his Mediæval ardour, and in him we see, at the height of the Renaissance, the supreme type of a Mediæval artist, yet, be it remembered, a type which without the Renaissance could not have been. As firm in his faith, and of a soul as high, he was the spiritual son of Dante and his peer; a Tuscan, a Christian, and, in the language of his art, an immortal poet. In his grave the art of Tuscany was buried; no flower grew over it. When he died in 1564, one Florentine of genius was still alive,—wild Benvenuto, to whom a short span was yet allowed. For a few years longer a Venusti, a Bronzino, a Daniele da Volterra remained to show how dull a thing art may become when the soul has gone from it and rhetoric replaces feeling. For a few years yet good Giorgio Vasari, King of Chroniclers, strutted in garments which he believed to be his master's; and then final night closed over



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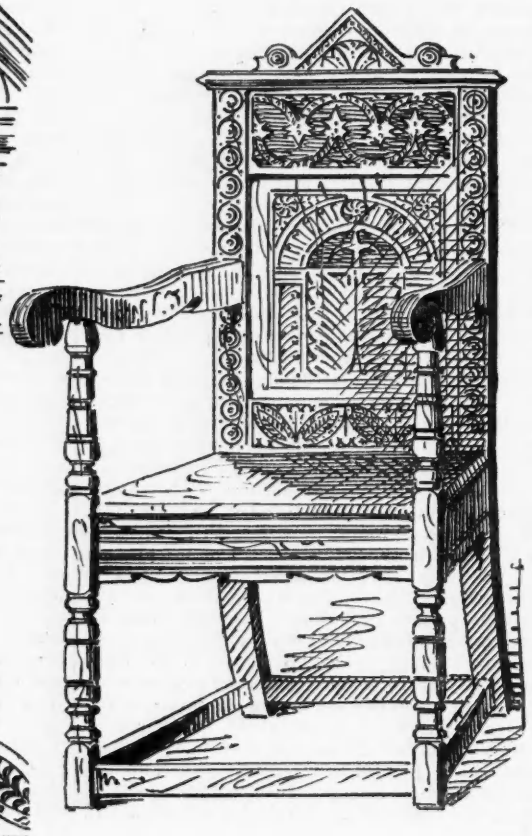

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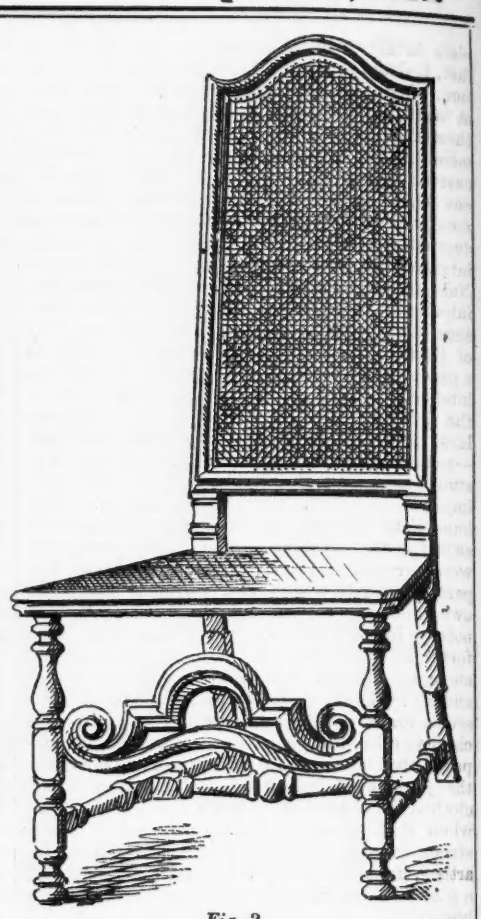

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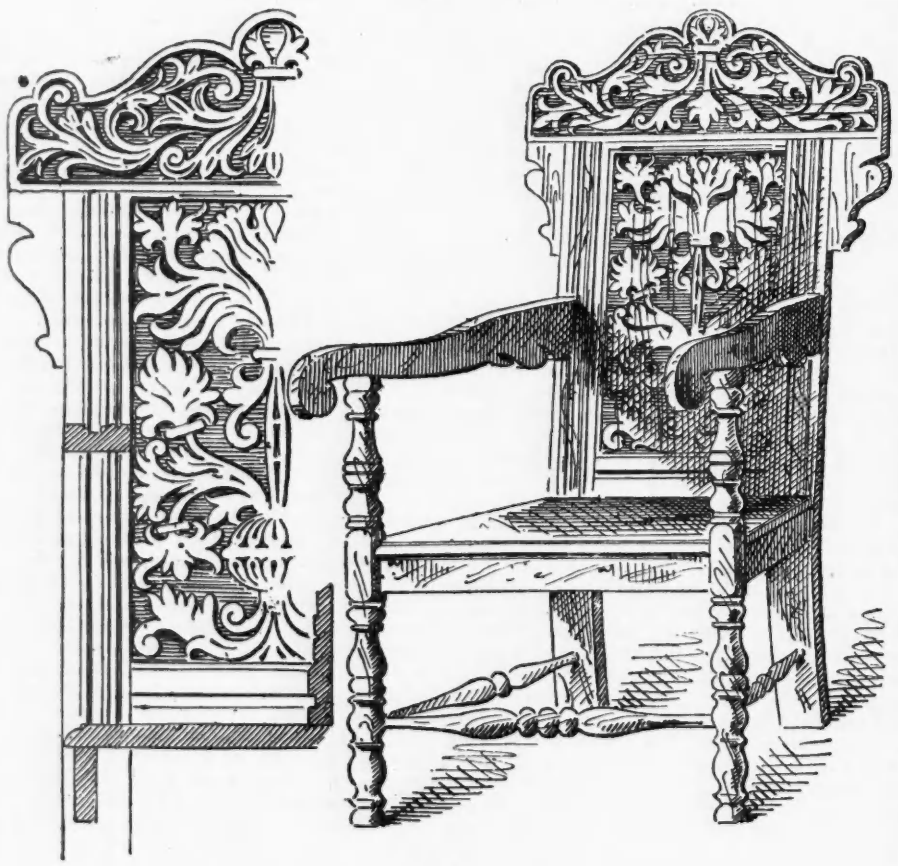


Fig. 2.

the art of Florence. The light of Italian art passed from the valley of the Arno to Venice, the city on the sea."

Home of Industry, Bethnal Green.—The new Home of Industry, Bethnal Green-road, E., was opened on the 18th of November. A building has been purchased and fitted up at a cost of 8,000*l.*, for the purpose of training boys for emigration, and for other philanthropic work carried on by Miss Macpherson. The architect was Mr. George Baines. The contractor was Mr. H. L. Holloway, of Deptford.

SOME OLD ENGLISH CHAIRS.

Of the three chairs illustrated, fig. 1 represents an old oak chair in St. Mary's Church, Guildford. The back is covered with elaborate ornament, carved, incised, and applied in roundels. The church contains some carefully-preserved examples of old fresco decoration.

Fig. 2 represents an old oak arm-chair in East Horsley Church, Surrey. It is of the Jacobean period, and the curious flowing ornament on the back panel and at the head is given in detail. The church also possesses some other interesting examples of woodwork of this period.

Fig. 3 is a sketch of an old chair in Little Bookham Church, Surrey. The church contains some interesting examples of Norman work, and also some good specimens of oak panelling, with incised ornament.

THE NEW METROPOLITAN SEWAGE WORKS AT BARKING OUTFALL.

As we have from time to time informed our readers, the Metropolitan Board of Works is now engaged in the construction of extensive works at Barking Outfall, with a view to the deodorisation, to some extent, of the sewage of the northern half of the metropolis. That some such palliative or curative measures are urgently called for, the foul state of the Thames in the neighbourhood of Woolwich during recent summers has amply demonstrated; whether the chemical treatment resolved upon by the Board will be effectual we have strong doubts, and have already given expression to them. As the works now in progress at Barking are to be completed next year, and as they will be, we fear, comparatively useless unless the chemical process adopted be at once economical and effective, we cannot but think that the subject is one deserving the widest and fullest discussion. Yet what do we find? The Board is to be asked, at its meeting to be held a few hours after these lines are published, to assent to the following motion:—

"That it be an instruction to the Works and General Purposes Committee to print, for circulation amongst the members of the Board only, the report presented to them by Sir Henry Roscoe, M.P., F.R.S., upon the deodorisation of the sewage at the outfalls, and the state of the Thames."

Why should this important report, by an eminent scientist, be circulated "*amongst the members of the Board only*"?

It is not our purpose here, however, to discuss the chemical aspect of the question, but rather to chronicle the progress of the very elaborate works now in course of construction at Barking, which we had an opportunity of visiting two or three weeks ago. They have been designed by the Board's Engineer, Sir Joseph Bazalgette, and the contract was let to Messrs. John Mowlem & Co. some nine months ago. The amount of the contract is 406,000*l.*, and probably we shall be within the mark if we say that the cost of the works when completed will be 500,000*l.* Half a million of money is a large sum to spend upon what many competent

chemists and engineers regard as a mere experiment. If the experiment turn out successful, so much the better for the long-suffering ratepayers. If it fail, they will be in for further heavy expenditure to carry the sewage down to Canvey Island or elsewhere.

The works included in the contract consist of precipitation reservoir or tanks; sludge settling channels; pier and jetty for discharging the sludge into ships and for general purposes; engine and boiler-houses for lifting the sludge and the effluent water; iron water station; settling pond for river water; superintendent's house and twelve workmen's cottages; liming station; and tramways and pipes for various purposes.

The sewage will be conveyed from the northern outfall sewer into precipitating tanks placed on the north side of the existing reservoir. There will be thirteen of such tanks, and the sewage will be admitted into each of them in succession and allowed to remain in a quiescent state to admit of the deposition of the sludge. When the solid matters in the precipitating channels are deposited, the effluent water will be run off into the river direct if the state of the tide is favourable; but otherwise into the existing reservoirs, to be stored there until the tide has fallen sufficiently to admit of its discharge. The sludge will be run off into sludge-settling tanks to be placed on the west side of the sewer, near the river, where it will be allowed to settle again, so as to allow of the removal of more of the liquid. This liquid will be drawn off and will be used for mixing the lime water, which will be admitted into the northern outfall sewer nearly half a mile above the precipitating tanks, where there will be stores for the lime and chambers for mixing it. The settled sludge will be run into stores under the tanks, and will be lifted and passed through pipes to a pier to be constructed in the river for the purpose of being loaded into ships and carried to sea.

There is a supplementary store for sludge in case of the sludge ships being delayed by stress of weather, and there are stores for the iron, and sheds for its manipulation and introduction into the sewage.

There will be engine-houses with engines for lifting the sludge and effluent waters, and for lifting the water containing the iron and lime; coal stores; a settling pond for purifying the river water for use in the various operations, and residences for the superintendent and some of the workmen. Tramways will be laid for conveying coals from the river to their various destinations in the works.

The works now in progress consist of excavations, concreting, and brickwork for the precipitation reservoir, liming station, and sludge-settling channels; foundations for engine-house and boiler-houses, and a jetty for loading steamers. Two chimney-shafts, service-tank for river water, twelve workmen's cottages, and a dwelling for the superintendent have been completed.

The old channel at Galleon's Sluice has been diverted into a new channel, which has been recently formed. Embankments have been formed from spoil for the purpose of receiving tramways in connexion with the various works. The principal works at present carried out consist of excavations, concrete, and brickwork foundations for the structural works.

The works have now been in hand, as already mentioned, about nine months, the first two months of which the contractors were engaged in building temporary jetties in the river Thames and Barking Creek, sinking sump and getting plant on to works. In the remaining seven months they have excavated upwards of 220,000 cube yards of ground, principally in long trenches for the walls of the sludge-settling channels, and in holes 6 ft. square for the brick piers to carry the arching over; they have used more than 135,000 cube yards of concrete, and built 2,600 rods of brickwork, the works so far executed being of the estimated value of 170,000*l*. The works cover an area of about eleven acres.

The number of men employed on the works at the present time amounts to about 2,200, and the quantity of permanent material unloaded amounts to 1,600 tons per day, and there are over forty boilers under steam.

The whole of the works are under the personal superintendence of Mr. G. Marshall, Assistant-Engineer to the Metropolitan Board of Works; and of Mr. J. Jackson, General Manager, and Mr. W. Rowell, Engineer, to the contractors. There is, it goes without saying, some admirable plant on the works, some quick-travelling steam cranes being especially effective and easy of manipulation.

GLASGOW INTERNATIONAL EXHIBITION.

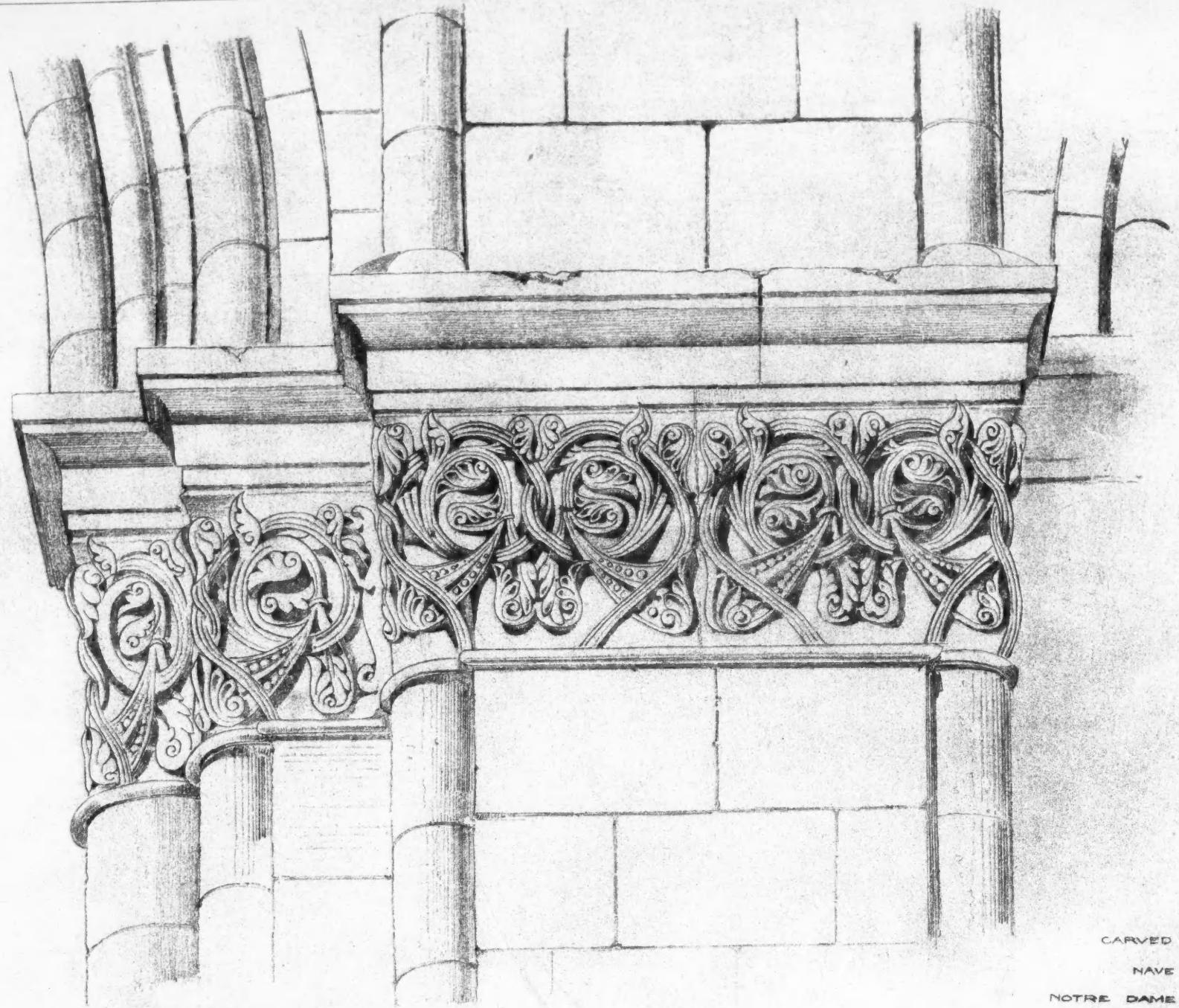
The contractors have now been at work for fully six months, and the building, including its 475,000 square feet of roofing, is already almost completed in the rough. The great central dome, with its four flanking towers, is almost the only portion still awaiting much of finishing work on the outside, and even here the ribbing and piecing operations are far advanced, promising a full crowning of the edifice within the space of a few weeks. The architectural effect of the design,—a strictly Oriental one in its more prominent features,—is not unpleasing; but the position or site which has been assigned to the erection is far from setting off its good points to the best advantage. On two sides,—east and south,—the houses of the city impinge quite closely on the building, the only separation being the breadth of a not very wide streetway. These houses are of the "flat" order common in the large towns of Scotland, compact, and of considerable height; and a glance at once shows that this unfortunately close overlooking of a large and wide-spreading, but relatively not at all lofty structure, has the effect of crowding and dwarfing the latter to a somewhat damaging extent, while at the same time diverting attention from the graceful lines which the elevation undoubtedly possesses. The situation of last year's Edinburgh Exhibition was much happier; in grounds exclusively its own, and sufficiently remote from the nearest city buildings to escape all injury likely to arise from the harshness of an abrupt contrast. As regards the Glasgow exhibition, extraordinary effort is being put forth to reinforce the main building with extraneous attractions, and to a large extent the open or park side to the north, with the river Kelvin crossing Clydewards on an easy curve, lends itself very freely to this end. The Kelvin is being deepened to a uniform depth of 6 ft., and next year, over the two or three furlongs of its course in the immediate vicinity of the Exhibition building, fancy craft of all kinds, including steam and electric launches, working ship models and torpedo boats, will be found moving briskly to and fro. A chronic foulness has long afflicted this once crystal tributary of the Clyde; but the evil will at least be mitigated if not removed by the cleansing expedients now being energetically taken in hand, these consisting of an extension of the left bank sewage culvert right down to the Clyde, and certain up-stream restrictions governing the inflow of refuse matter. Other extramural attractions are comprised in a timber and plaster reproduction of Glasgow's ancient episcopal palace, to be utilised in housing the Antiquarian Section of the Exhibition, an electric fountain of 120 ft. base diameter, a switchback railway, a terra-cotta fountain, 85 ft. high, presented by Doulton & Co., Lambeth, &c. The rather unhappy financial results lately attending one or two similar Exhibitions elsewhere have been exercising the minds of the guarantors not too pleasantly; but, in any case, the event of next year, regarded simply as a display, is almost certain to rank as a high success. Considering the plethora of grand exhibitions which the present and recent years have produced, Glasgow's effort may have been dated just a little too late for a signal financial triumph; but having put its hand to the plough, it is not likely that the City will grudge either pains or outlay to secure a creditable issue. The works contract now in course of fulfilment involves expenditure to the amount of about 60,000*l*.

ARCHITECTURAL SOCIETIES.

Birmingham Architectural Association.—The third ordinary meeting of the current session was held at Queen's College on Tuesday evening last. Mr. W. Doubleday (vice-President) took the chair. A paper was read by Mr. Whitworth Wallis, F.R.G.S., on the "Temples, Forum, Theatres, and Tombs of Pompeii." The lantern views illustrating the lecture were of the most interesting description. Temples, theatres, tombs, frescoes, statuary, &c., succeeded each other in an almost bewildering variety. The City of the Dead became, indeed, for the time a city full of life and vivacity. The drapery of the statues which have lately been unearthed rival those of the best Greek period. A vote of thanks, proposed by Mr. W. Doubleday and supported by Messrs. Newton and Victor Scruton (hon. sec.), was unanimously accorded to Mr. Wallis for his very interesting lecture, and after a response from that gentleman the meeting terminated.

Manchester Architectural Association.—The last ordinary meeting was held at the Diocesan Buildings on the 13th instant, Mr. A. H. Davies-Colley (President) in the chair. The Rev. R. H. Snape read a paper on "Scotch Cathedrals." He prefaced his remarks by saying that as he had spent several of his earlier years as an architect and had visited the whole of the English as well as the Scotch Cathedrals, he claimed some right to speak on this subject. Our views of cathedrals must be very much modified when we come to Scotland, as they are more correctly speaking simply kirks, numbering in all about fourteen. Transepts, cloister courts, and crypts are non-existent except in a very few cases; towers and spires are also few and very irregularly placed. The round arch is to be found in nearly every style, but the Perpendicular has hardly an example. The crypt of the Glasgow Cathedaal is the finest in England or Scotland. The abbeys more than rival the cathedrals. A discussion followed in which Messrs. J. T. Hodgson, H. M. Mee, T. Chadwick, Ward, and the chairman took part.

Edinburgh Architectural Association.—The usual fortnightly meeting of the Association was held on the 8th inst., in the Architectural Hall, 42, George-street; the President, Mr. Hippolyte J. Blanc, occupied the chair. After the usual preliminary business and admission of new members, Mr. John Wallace read a paper on "Italian Monuments." After an introduction explanatory of the scope and object of the paper, in which precedence was given to the Early Renaissance tombs of the fifteenth century, not only as being of singular interest from their intrinsic excellence and suitability for their purpose, but as throwing valuable light on the rise of Renaissance art and the influence this department of design had on architecture proper, the Gothic tombs of the thirteenth and fourteenth centuries were referred to in detail. The tombs of the Scaligeri at Verona were described and instanced as being, *facile princeps*, of supreme importance, because giving dated examples of the best Gothic work during the whole time of its prevalence in Verona. The earliest examples of Renaissance tombs,—those of the quattrocento period,—were next spoken of, Tuscany being the home of their birth and most perfect development. The Florentine school of sculpture being at its strongest at that time, and the best masters of the craft devoting their best energies to this class of work, it was not to be wondered at that for combined architectural and sculpturesque effect these tombs stood unrivalled. The love of pomp and ostentation was shown to have gradually produced decadence and prevented the healthy development that might otherwise have been expected from the early promise of Renaissance art,—combined, however, with increased robustness of character,—to be commended had the standard of refinement and excellence in sculpture been preserved. The decay of taste during the cinque-cento period, with its grandiose effects, were traced to the same insidious influence, only partially assisted by the genius of Michelangelo, whose well-known tombs of the Medici family in the church of St. Lorenzo at Florence were claimed to rank with the best works of this master. The vagaries of the Rococo School were then referred to, and instances given of the debasement of art by this licentious school, till, by the middle of the seventeenth century, the last degradation was reached. Reference was then made to the modern Italian tombs, as exemplified in the Campo-santo at Genoa, regret being expressed that effort should be so misdirected; ignoble realism in the dexterous representation of lace and ribbons, and the trivial accessories of modern dress being aimed at, to the exclusion of the higher qualities of sculpturesque design. The value of a study of these ancient monuments was expressed with a view to improvement in this department of design in modern work. The paper was illustrated by a collection of photographs. At the close a hearty vote of thanks was awarded to the lecturer.



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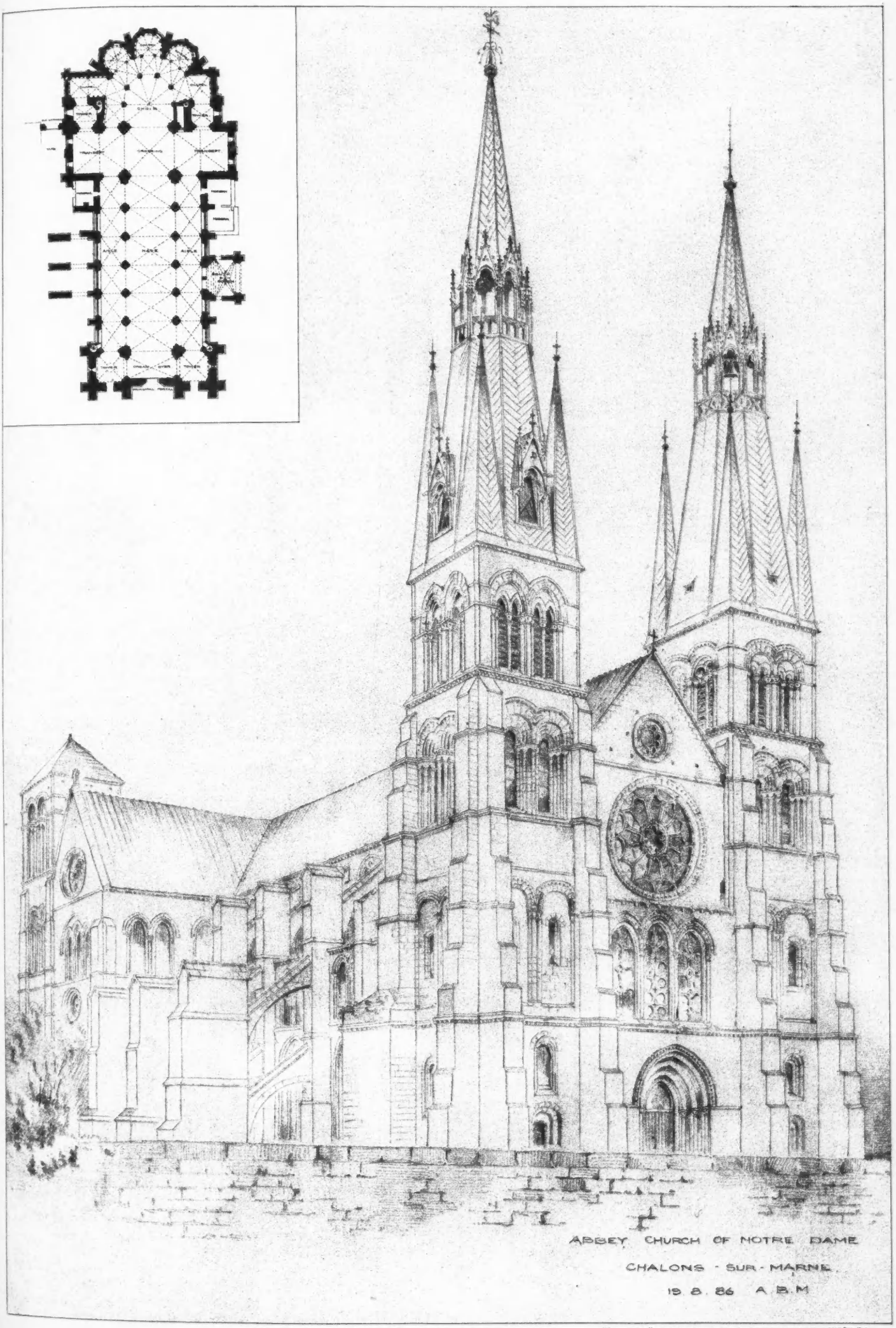
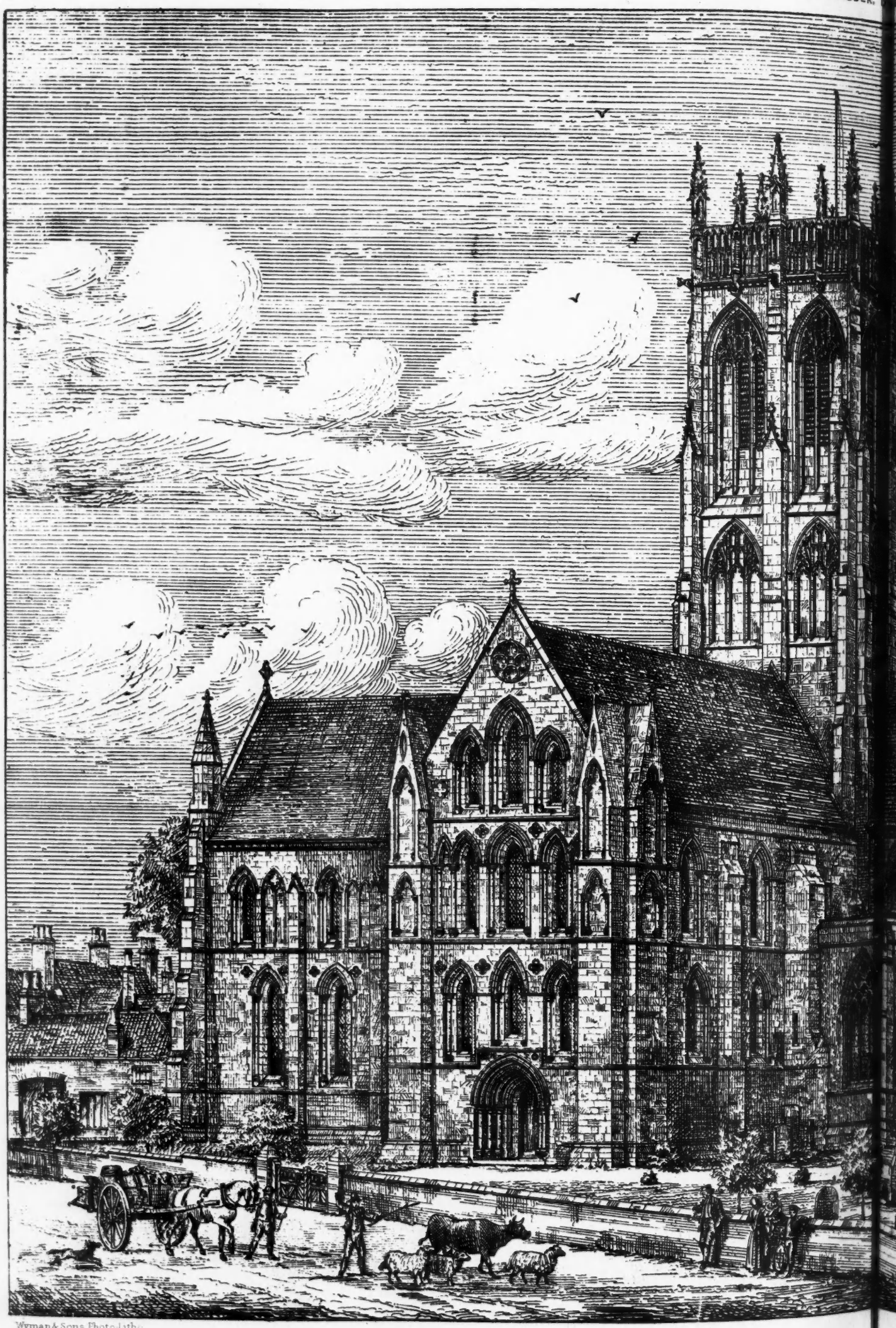


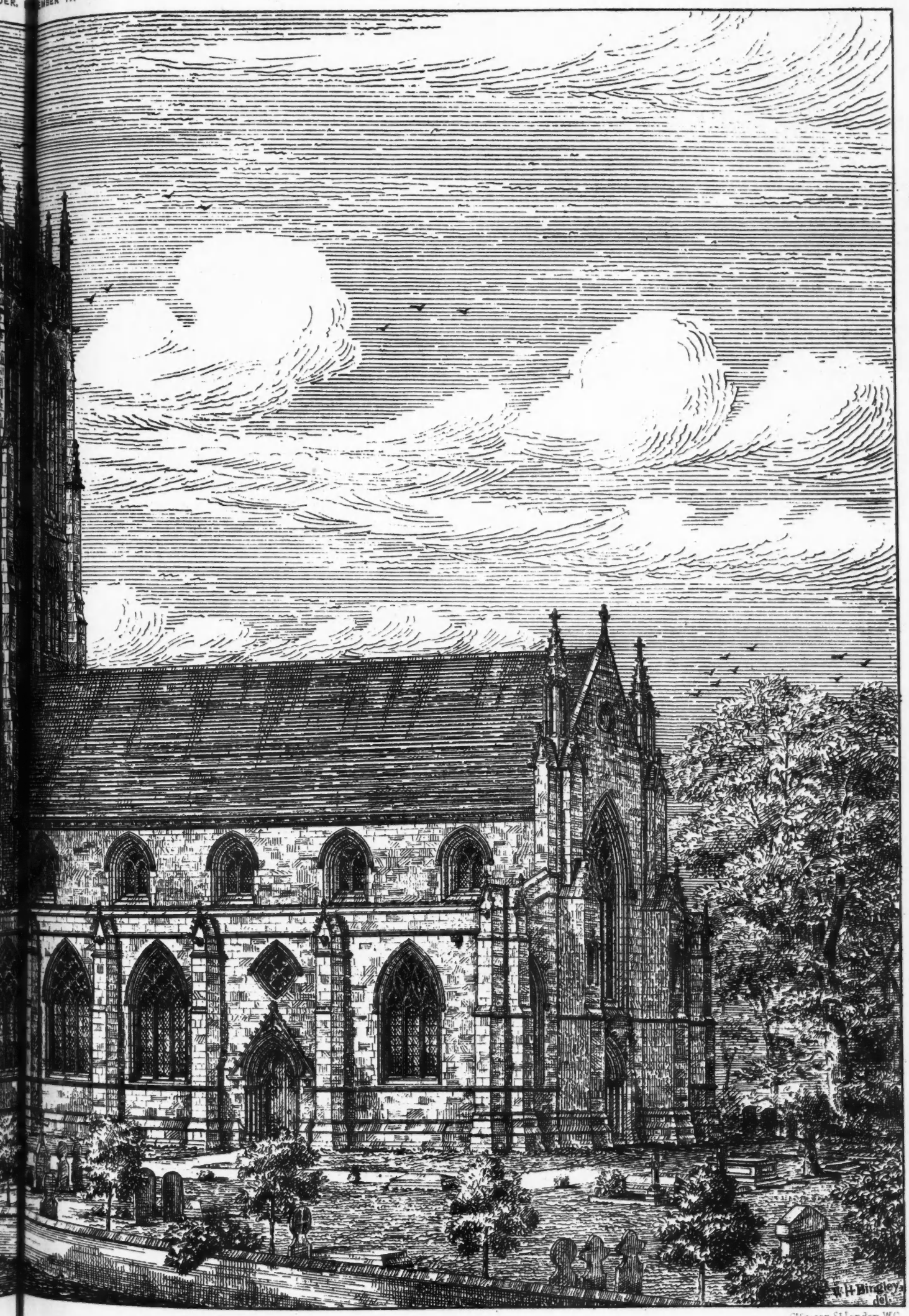
ABBEY CHURCH OF NOTRE DAME
CHALONS - SUR - MARNE.
19.8.86 A.B.M

"INK-PHOTO," SPRAGUE & Co., 22, MARTINS LANE, CANNON ST., LONDON, E.C.



Wyman & Sons Photo-Lith.

CHVRCH OF S. AVGVS

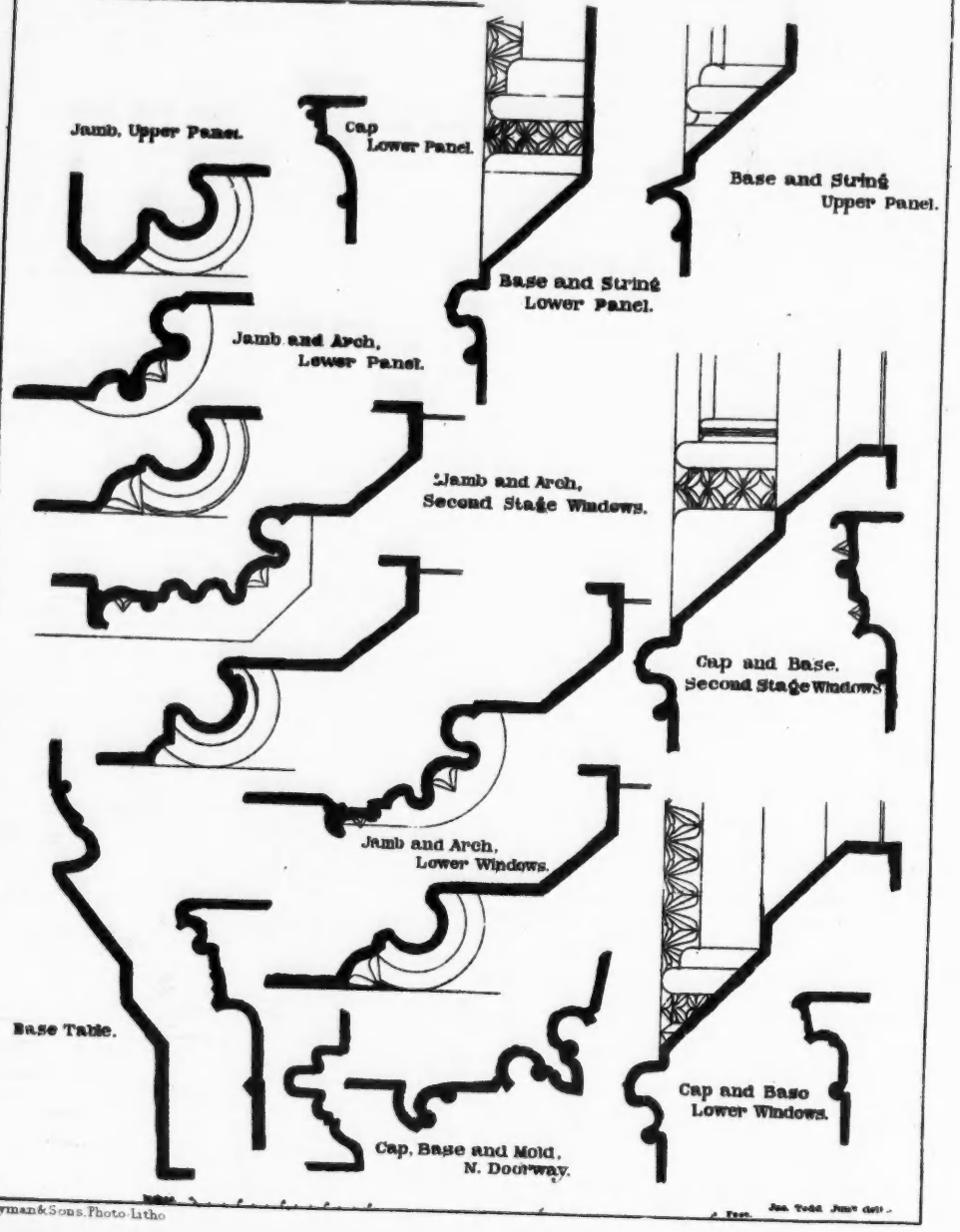


6 Queen St London WC

AVGVSTINE, HEDON

CHURCH of S. AUGUSTINE, HEDON.

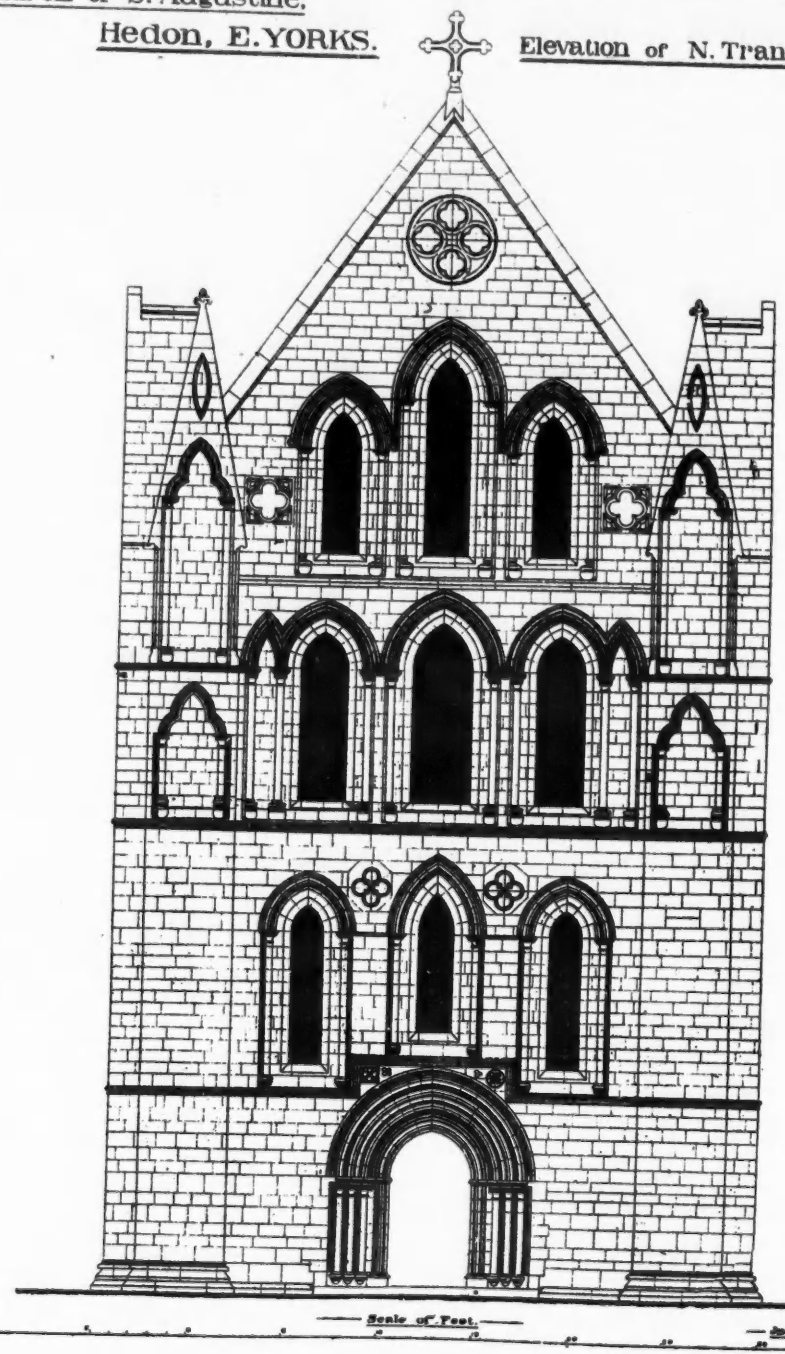
DETAILS, NORTH TRANSEPT FRONT.


Jamb, Upper Panel.
Cap Lower Panel.
Base and String Upper Panel.
Base and String Lower Panel.
Jamb and Arch, Lower Panel.
Jamb and Arch, Second Stage Windows.
Cap and Base, Second Stage Windows.
Jamb and Arch, Lower Windows.
Base Table.
Cap and Base Lower Windows.
Cap, Base and Mold, N. Doorway.
Jno. Todd. Junr. del.

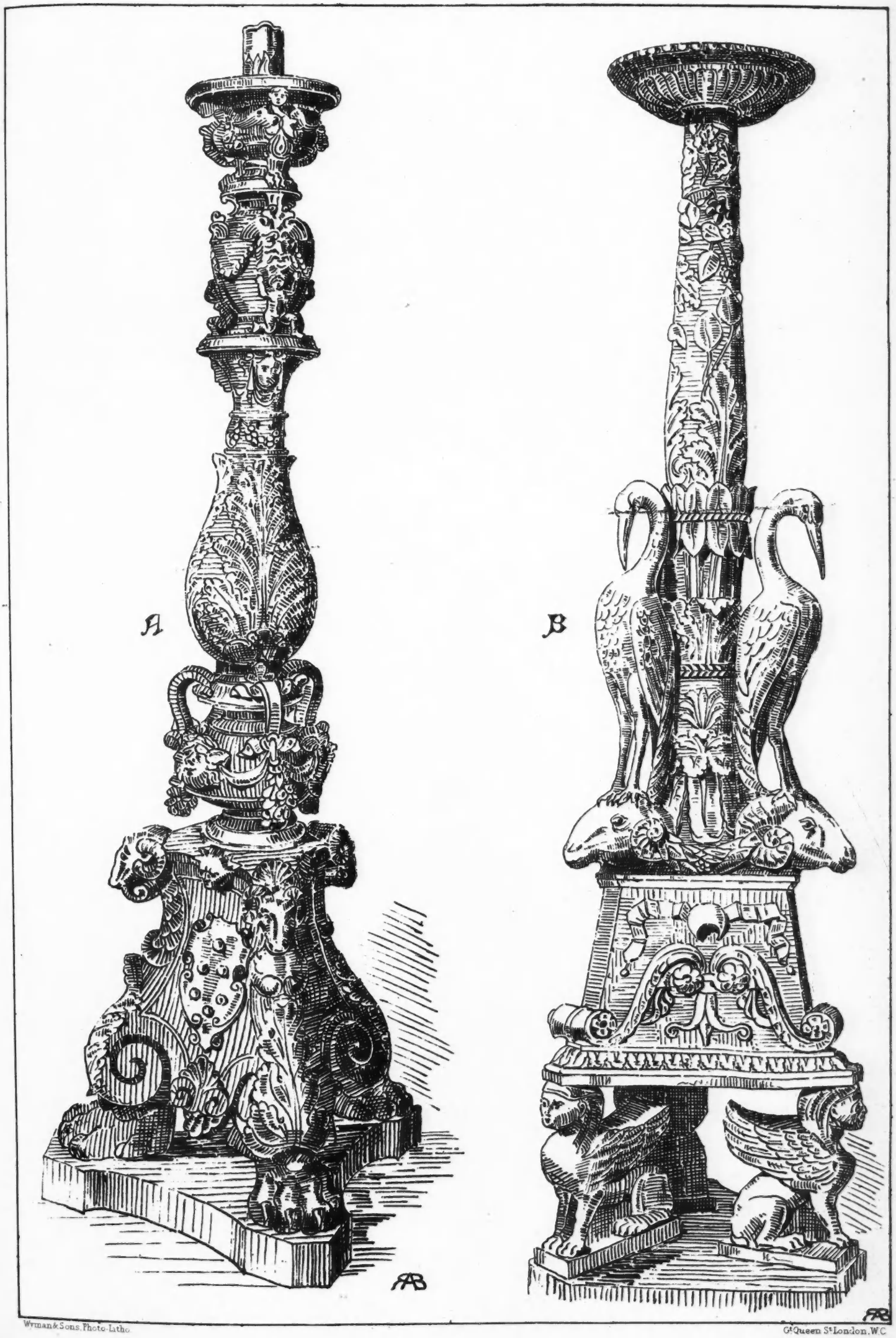
Wyman & Sons, Photo-Litho

Church of S. Augustine, Hedon, E. YORKS.

Elevation of N. Transept Front.



46 Queen St. London, W.



Wyman & Sons, Photo-Litho. Gt Queen St London, W.C.

CANDELABRA FROM ITALIAN MUSEUMS.—FROM SKETCHES BY MR. R. A. BRIGGS.

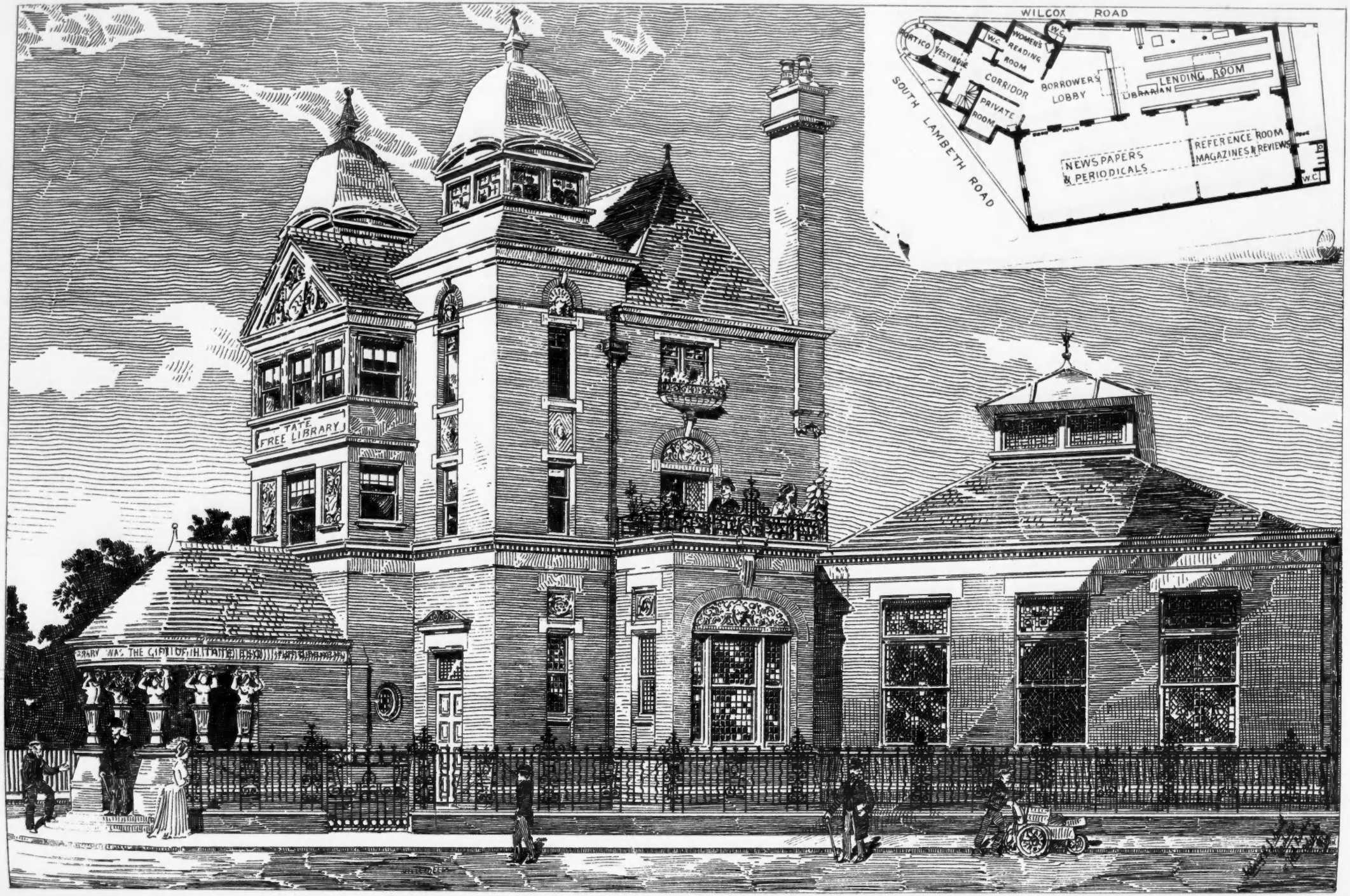


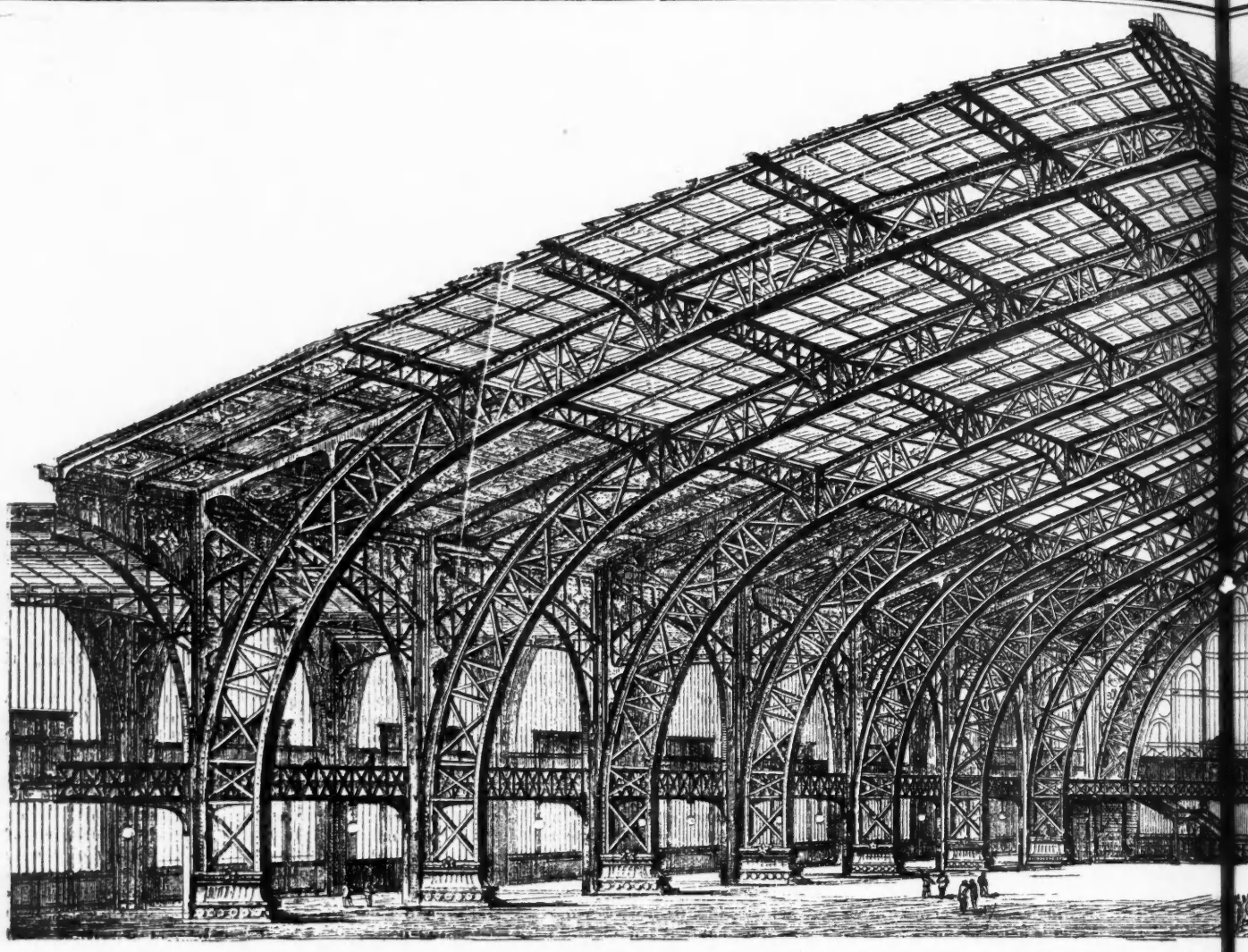
PHOTO-LITHO. SPRAGUE & Cº 22, MARTINS LANE, CANNON ST, LONDON, E.C.

TATE FREE LIBRARY, LAMBETH ROAD.—Mr. Sidney Smith, A.R.I.B.A., Architect.

TATE FREE LIBRARY, LAMBETH ROAD.—Mr. Sidney Smith, A.R.I.B.A., Architect.

PHOTO LITHO, SPRAGUE & Co 22, MARTINS LANE, CANNON ST, LONDON, E.C

HOREHAMHURST, SUSSEX.—Mr. H. P. Monckton, A.R.I.B.A., Architect.



THE GALERIE DES MACH

THE "GALERIE DES MACHINES" FOR THE 1889 EXHIBITION.

We give a view of this immense iron structure, but a small part, however, of the vast show with which Paris is preparing to astonish the world in 1889. The "Galerie" is being erected at the south side of the Champ de Mars, parallel with the Avenue Lamothe Piquet.

The architect for the work is M. Dutert, assisted in the iron details by M. Constantin, engineer-in-chief for the metallic construction of the Exhibition.

The gallery is 420 mètres in length, and 43½ mètres in height, and 115 mètres wide; in other words, a span of nearly 380 ft.

It is intended that the structure should be completed during the course of next year; the total cost will be about three millions of francs.

Illustrations.

CATHEDRAL, CHALONS-SUR-MARNE.

We gave recently Mr. Mitchell's fine drawing of the interior of this cathedral; we have now the pleasure of giving two more drawings by him, one showing the exterior of the cathedral (some description of which will be found on page 770, *ante*) and the carved capital of one of the nave piers, a fine and interesting example of Early Gothic work, with reminiscences of Greek detail in parts.

CHURCH OF ST. AUGUSTINE, HEDON.

The borough of Hedon, though now only small and insignificant, was formerly of some considerable importance, and dates far back into history, having had a charter granted to it by King John. We are told that when Hull was but a fishing village, Hedon was a thriving seaport, enjoying the benefit of an extensive maritime commerce. Possessing at one time three churches, it is now reduced to one, which we must confess constitutes the only object of interest in the town. However, its dignified appearance, purity of detail, and convenient size, eminently fit it to be a worthy model, which may be studied with profit again and again. It is yearly becoming better known to architectural students, a number of whom, of late years, have taken full advantage of easy access to such a fine example of Mediæval art, and no doubt will soon be known as "a much-measured building."

As will be seen from the perspective view, it is cruciform on plan, and exemplifications of every style of Gothic may here be found, from Transitional to Late Perpendicular. The earliest part of the fabric is the south transept, the door of which is round-arched, with fine bold mouldings. This transept was almost entirely rebuilt some years ago, by the late Mr. G. E. Street. A fine rose-window from his design fills the gable. The chancel and north transept follow in point of time, appearing of about the same date, and being of pure Early English. The front of the north transept presents as fine a study as can be found in a moderately-sized church. It is shown in a geometrical drawing given on another plate, along with sections of the mouldings. The nave is of five bays, the four adjoining the tower of the Geometrical period; the remaining bay and the west front of the ensuing period of the Later Decorated style. The tower is about 130 ft. high.

The nave, north transept, and chancel were restored about ten or twelve years ago by a since-deceased local architect. Before this, the whole of the roofs were of flat pitch, and covered with lead, the gables having been taken down to the eaves level, and the west window was filled with tracery of a most atrocious design. The chancel still retains a good Perpendicular window.

Nothing remains of the Lady-chapel except a part of the east wall, which has been incorporated in a vestry of the Late Gothic period.

CANDELABRA FROM ITALIAN MUSEUMS.

These two examples of Italian candelabra are from drawings by Mr. R. A. Briggs. That marked A is a fine work in bronze, standing about 6 ft. high, and is in the Bargello at Florence. It bears on the base the device of the Medici, a shield studded with little round knobs, which are supposed to represent pills.

The one marked B is executed in marble, and is in the Museo Nazionale at Naples.

THE NEW LIBRARY FOR LAMBETH.

We give an illustration of the new library building which is being erected in the South Lambeth-road, S.W., for the Lambeth Libraries Commissioners. The entire cost of the building and site is being defrayed by Mr. Henry Tate.

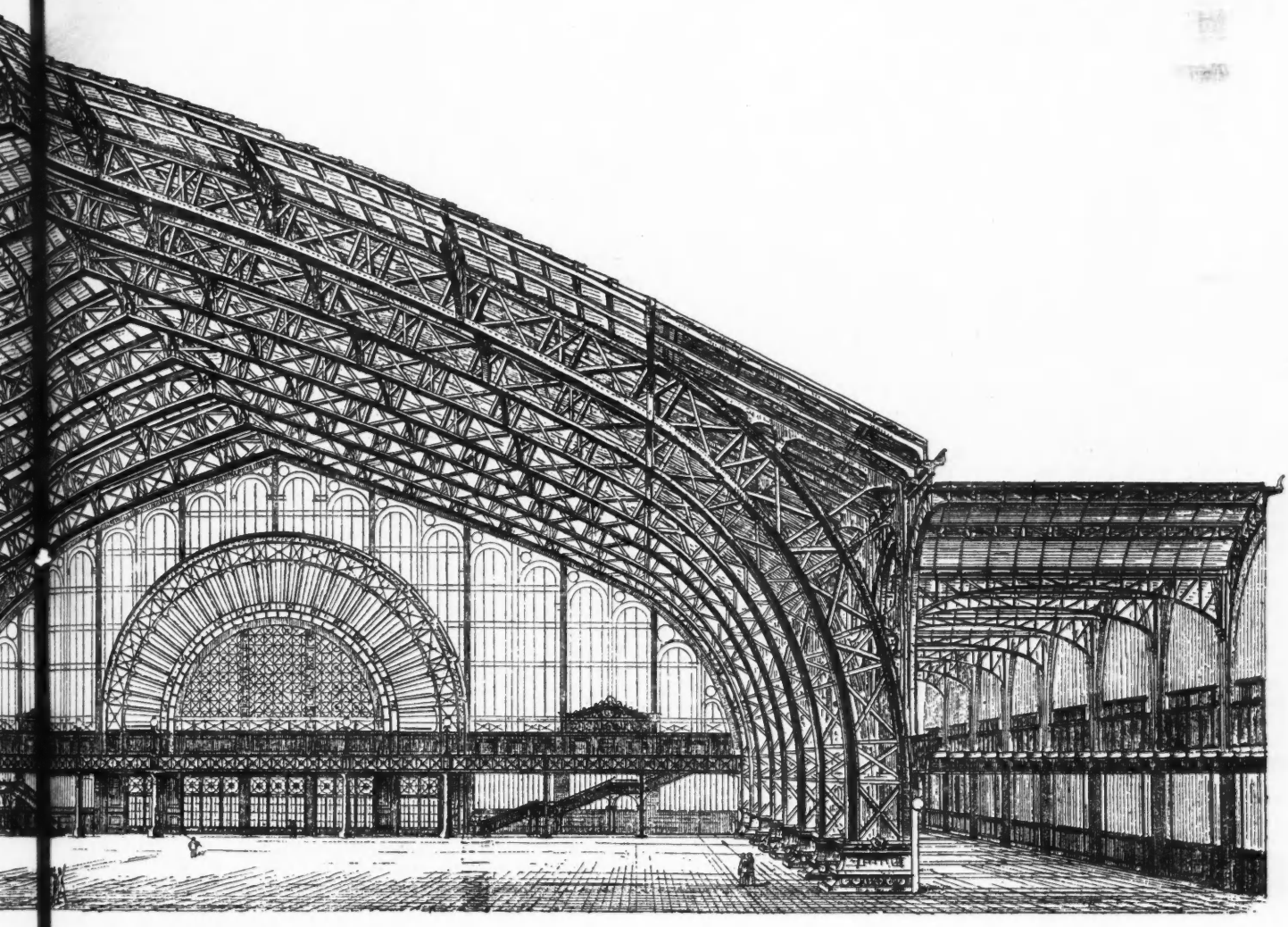
The materials used in the construction will be red bricks, with Portland stone for dressings, green slates for roofs, and copper domes to turrets. The interior facings of reading-rooms, &c., will be of stock brick, relieved with red bands and arches, the roofs being open timbered, and with skylights over. The floors of the public lobby, &c., will be of wood blocks, and the corridors tile-paved. The front part of the building shown on our illustration is a house for the librarian. The general dimensions of the various rooms are:—Newspaper and periodical room, 48 ft. by 27 ft.; reference-room, 27 ft. by 28 ft.; lending libraries and book-store, 48 ft. by 23 ft.; women's reading-room, 13 ft. by 13 ft.; private room, 13 ft. by 12 ft.; public lobby, 20 ft. by 20 ft. In the basement is a heating-chamber and book-room, &c. The architect is Mr. Sidney R. J. Smith, and the builder Mr. Nightingale.

HOREHAM HURST, SUSSEX.

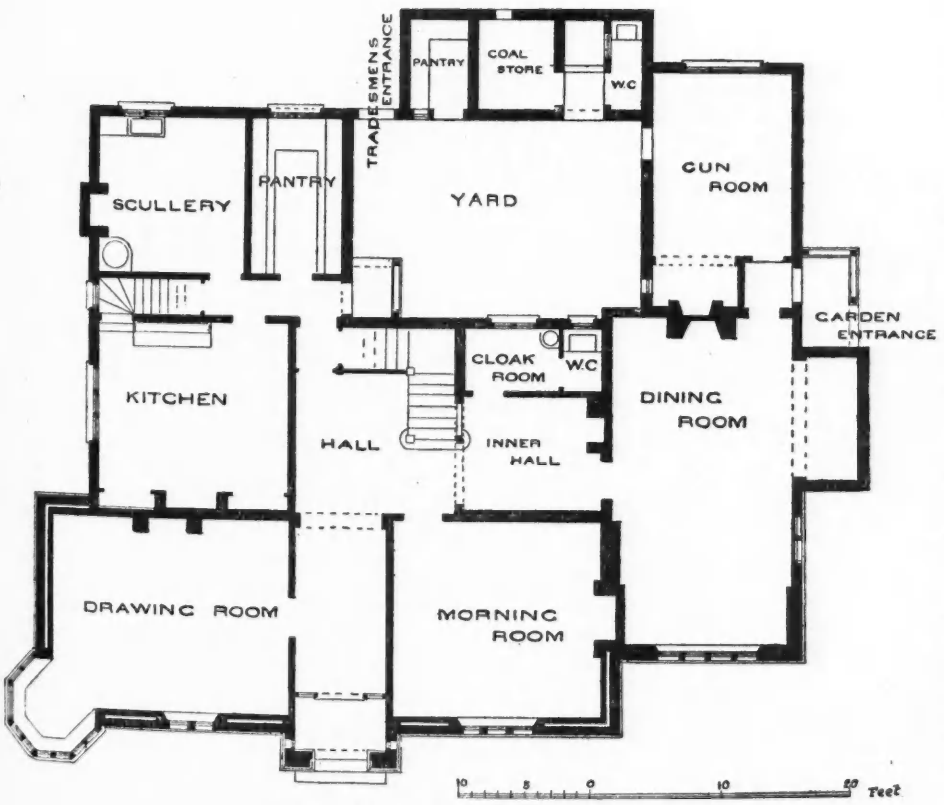
This country residence, recently erected in Sussex, is situated on an elevated site in park-like grounds at the extreme corner of Hellingly Parish, adjoining the Horeham Manor Estate.

It commands in all directions lovely views of the county scenery and also a view of the sea beyond Eastbourne.

In designing the elevations the main object in view was to produce a comfortable home in character with the old Sussex style, and this has



MACH THE PARIS EXHIBITION OF 1889.



Plan of House, Horeham Hurst, Sussex.

been obtained by facing the building externally to the first-floor level with dark red bricks and Bath stone dressings, the floor above that height being constructed with massive horizontal and vertical timbers placed about 2 ft. apart showing externally and filled in between the double lath and plastering, with 3 in. cavity, and finished outside with solid cement and rough-cast shingle of a warm yellowish tint, the roof being covered with dark brown tiles and bright red ridge tiles. The house is approached from the entrance lodge (which is of similar design) by a winding avenue of oaks. Owing to the utilisation of existing buildings on the site the relative position of the kitchen and dining-room was unavoidable.

The work has been carried out by Mr. Daniel Ashdown, builder, of Horeham-road, Sussex, under the superintendence of the architect, Mr. H. Percy Monckton.

ELECTION OF CITY ARCHITECT.

THE election of a City Architect and Surveyor to the Corporation of London, in the room of the late Sir Horace Jones, took place on Thursday afternoon last, at a meeting of the Court of Common Council. The following were the candidates:—Mr. H. D. Appleton (age 34); Mr. Charles Barry (63); Mr. Francis Chambers (58); Mr. Goymour Cuthbert (38); Mr. W. H. Crossland (52); Mr. T. Milbourn (52); Mr. C. N. McIntyre-North (50); Mr. Alexander Peebles (47); Mr. J. H. Smith (34); Mr. B. Tabberer (56); and Mr. J. Tanner (53).

A proposal was made that the voting should be by ballot, and this was eventually agreed to, and it having been announced that Messrs. Chambers and Smith had withdrawn, the voting was proceeded with, with the following results, viz.:—

Appleton, 2 votes; Barry, 45; Cuthbert, 6; Crossland, 31; Milbourn, 4; McIntyre-North, 3; Peebles, 85; Tabberer, 4; Tanner, 0.

As none of the candidates had a clear majority of votes cast, the three standing highest in the list were again voted for, when there were for Mr. Barry, 43; Mr. Crossland, 20; and Mr. Peebles, 107.

Mr. Peebles was accordingly declared elected.

Lectern, Tunstead Church.—A carved oak eagle lectern, a replica of one supplied to the English Church at Neuilly, near Paris, has recently been executed for Tunstead parish church, by Messrs. Jones & Willis.

Proposed New Theatre for Edinburgh.—We learn from the *Scotsman* that in the Edinburgh Dean of Guild Court plans have been lodged for the erection of a theatre on ground immediately to the south of West Nicolson-street, Edinburgh.

THE APPRENTICES' EXHIBITION.

The Apprentices' Exhibition, opened at the People's Palace, Mile End, on Saturday last, by H.R.H. the Prince of Wales, is, on the whole, a creditable display of work, and though it contains nothing particularly noteworthy, it may be visited with advantage by those for whose special behoof it has been opened, viz., young workmen, and apprentices, and lads about entering upon apprenticeship. There is much in the exhibition to interest the general public, of course, and the exhibits of the students of the Polytechnic and similar institutions serve to show that, while there is, and has been, much talk of late years about technical education, some little amount of practical work is being done; but, to our thinking, one defect of the exhibition is that the consecutive processes of the various trades represented are not in all cases so fully shown as they might be. The exhibits fill two long and well-lighted galleries, parallel to each other. In the one to the left hand of the entrance some of the building trades are toleraby well represented, and there are a few exhibits pertaining to the same trades in the other gallery.

The students of the School of Art Wood-Carving show a number of specimens, most of them exhibiting much merit, considering the age of the pupils, and giving promise of greater achievements in a year or two.

A few of the Cabinet-making students of the Polytechnic Young Men's Christian Institute exhibit a number of articles of furniture which are, as a rule, well designed (we do not understand that in any case the designs are by the makers of the articles), and constructively far superior to much of the "shoddy" work which is to be seen on sale in the Tottenham Court-road and elsewhere. A dressing-table by John Slade, a cabinet by Albert Atkinson, and tables by C. R. Burke and W. T. Wilkinson (all apprentices), may be named as examples.

Some of the students of the Plumbing Classes of the same excellent Institution show a very fair collection of specimens of craftsmanship, under the appropriate motto "Nothing like Lead." John James Green, Thomas C. Fenn, and H. E. Belton are exhibitors of some good examples of pipe-bending and wiped joints, and there are also several examples of bossed leadwork, the most successful and pracical of which is a lead finial by Thomas Miller Ross, an apprentice of six years' standing. The portrait-busts executed in the same manner also exhibit much skill, but lead is a material which does not lend itself to agreeable effects when used for portrait busts. There was little or nothing in this collection, by the by, which was illustrative of the *principles* upon which plumbing work should be done, which is the more to be regretted, inasmuch as skilled workmanship in execution will not only not atone for work planned on wrong principles, but may, in conceivable cases, intensify the evils and dangers resulting therefrom.

Several students of the same Institution exhibit good specimens of modelling in plaster, but there is nothing noteworthy about them; like the specimens of metal-chasing and *repoussé* work adjoining, also by students of the Polytechnic, they are fairly good, and that is all. Mr. E. King, a die-sinker, who has been three years at his trade, receives a special award for a panel bearing an expresively-modelled lion in relief. Another student of the same Institution, John Smart, a stone-mason, aged 23, exhibits a well-executed though somewhat heavily-designed, window; and adjoining, Horatio Canwick, aged 22, and Alfred Horne (age not stated) exhibit specimens of fine-jointed brickwork, such as is the vogue in "Queen Anne" work.

Among the best specimens of wrought-iron work shown by the students of the Institution several are marked "not for competition" (why, we are not told); but not coming under this restriction is a lantern by Albert Higgins, age 19, which exhibits some very delicately-executed work.

Some other students of the same school exhibit panels of carved wood, many of them very good in execution. J. Davis, aged 20, a joiner, exhibits his skill in staircase work.

Passing now to exhibits not by students of the Polytechnic School, we may mention as meritorious the staircase models shown by A. J. Down (aged 20), E. C. Davis (age not stated), and J. Irving. Passing by some more specimens of plumbing work of no special interest, we come to a screen containing drawings executed by the students of the People's Palace Art School, and to another screen containing mechanical working drawings executed by students of the Polytechnic Day-school; some of the last-named drawings are models of what mechanical working drawings should be, with dimensions, &c., clearly figured. Next is a screen containing a number of well-executed drawings giving details of building construction by Robert Sinclair, in which we noticed some points that appeared open to criticism; for instance, in the drawing showing a queen-post roof-truss, the projection of cornice shown in a large-scale section of the outer wall seems to be greater than would be safe in execution.

Messrs. Perry & Co., of Tredegar Works, Bow, the well-known builders, exhibit a carpenter's shop, occupied by E. P. Trent and P. N. Smith, two of their apprentices. Here the various processes of mortising, tenoning, scarfing, sawing, &c., performed by hand, as in pre-machinery days, are exhibited in the execution of actual work. The apprentices here, as at several of the other stands, are habited in Mediæval costumes similar to those which were to be seen at the shops in "Old London" at the recent South Kensington exhibitions.

J. J. Thompson, aged 18, a pattern-maker, who has been four years at his trade, exhibits a well-made model of an iron roof suitable for a railway station; but this should not be exhibited with the carpentry exhibits, as it was when we saw it.

Bookbinding, printing, coopers' work, silversmiths' work, meteorological glass-blowers, surgical instrument makers, watch and clock makers, opticians, drawing-instrument makers, organ-builders, lead glaziers, electric-lighting apparatus makers, tinsmiths, brass-finishers, pewterers, japanning, wire-working, fret-cutting, and potting (some of Messrs. Doulton's apprentices sending some vases of good outline), shoe-making, basket-making, carving, upholstery, and weaving are among the other trades exhibited.

Exclusively women's industries do not seem to be so largely represented as we had expected in an exhibition held in the East End of London; but of needlework and articles of clothing, executed by young girls apprenticed to milliners and dressmakers, there is a small but representative show.

Some of the pupils of the Jews' Hospital and Orphan Asylum, West Norwood, are exhibitors of simple articles of joinery made as the result of technical instruction received in the workshop of the Institution for four hours weekly. The exhibits are by boys of thirteen or fourteen years of age, who have only received technical instruction for the few hours named during periods of from four to twelve months. Though the articles exhibited are of a very ordinary kind, they certainly give good evidence of what can be accomplished with tools by boys in school workshops; and the knowledge of the use of tools is likely to be of no slight value to the boys when they leave school, whatever trade or calling they may choose to follow.

The Exhibition is to remain open until the 31st inst.

THE INSTITUTION OF CIVIL ENGINEERS.

At the ordinary meeting on Tuesday, the 6th of December, the paper read was on "Electrical Tramways: the Bessbrook and Newry Tramway," by Edward Hopkinson, M.A., D.Sc., Assoc. M. Inst.C.E.

Although a number of electrical tramways had been constructed in the United Kingdom during the last few years, there had hitherto been no attempt at the regular haulage of minerals and goods, nor at the operation of cars larger than the ordinary tramway type. Probably in no case had the effective power of any single motor exceeded about 4-horse-power. The principal object of the present paper was to describe the construction and to discuss the working of the Bessbrook and Newry Electrical Tramway, which had been designed for the haulage of heavy goods as well as for passenger traffic. The length of the line was rather more than three miles, with an average gradient of 1 in 86, the maximum gradient being 1 in 50. According to the conditions of the contract, ten trains were to be run in each direction per day, providing for a daily traffic of 100 tons of minerals and goods, and capable of dealing with 200 tons in any single day, in addition to the passenger traffic. The electrical locomotive was to be capable of drawing a gross load of 18 tons on the up-journey, in addition to the tare of the car itself and its full complement of passengers, at an average speed of six miles per hour, and a load of twelve tons at an average speed of nine miles an hour. Also, the cost of working, as ascertained by six months' trial, was not to exceed the cost of steam-traction on a similar line. The line was formally taken over by the company, as having fulfilled the conditions of the contract, in April, 1886, and had since been in regular daily operation. It was worked entirely by water-power, the generating station being adjacent to the line at a distance of about one mile from the Bessbrook Terminus. There were two generating dynamos of the Edison-Hopkinson type, driven by belting from the turbine-shaft, which was extended into the dynamo-shed for the purpose. The turbine could develop 62 horse-power, and each dynamo was intended for a normal output of 250 volts, 72 ampères, though they were capable of giving a much larger output. The current was conveyed to the locomotive-cars by a conductor of steel, rolled in the channel form, laid midway between the rails, and carried on wooden insulators nailed to alternate sleepers. The conductor was not secured, but was simply laid upon the insulators which fitted into the channel, and while allowing for longitudinal motion to compensate for changes of temperature, held it laterally. At one point the line crossed the county road obliquely, the crossing being 150 ft. in length. In this case the conductor on the ground level was not feasible, and an overhead conductor on Dr. John Hopkinson's system was substituted, by which the collector on the car consisted of a bar only, which passed under the supports of the overhead wire, and made a rubbing contact with its under surface. This system had been found to give very satisfactory results in practice.

The locomotive equipment of the line consisted of two passenger-cars, each provided with a motor. The body of the car was carried on two four-wheel bogies, the motor being fixed on the front bogie, so as to be entirely independent of the body of the car. The longer of the two locomotive-cars was 33 ft. in length, and was divided into three compartments, the front one covering the motor, and the two others forming first and second class compartments, together accommodating thirty-four passengers. The front bogie carrying the motor had an extended platform projecting beyond the body of the car, and communicating by a slide door with the dynamo compartment, thus giving the driver direct access to all parts of the driving machinery, which were at the same time entirely boxed off from the passenger compartments. The weight of the locomotive, including the dynamo, was 8¼ tons.

Apart from the electrical working of the line, an important and novel feature was the plan by which the wagons used on the line could also be used on the ordinary public roads, so avoiding the necessity of trans-shipment, and enabling goods to be loaded at the wharfs and drawn to the line by horse-power and again delivered where required. The plan was originally suggested by Mr. Alfred Holt, M.Inst.C.E., of Liverpool, and was embodied in the Lancashire Plateways Scheme, for which a Bill was lodged in the autumn of 1882 and subsequently withdrawn. The idea had been worked out in a practical form with great success by Mr. Henry Barcroft, of Newry, one of the directors of the Tramway Company. The wheels of the wagons were constructed without flanges, with tires 2¾ in. wide, which was sufficient for use on ordinary roads. Outside the tramway rails, which weighed 41·25 lb. per yard, second rails were laid, weighing 23·75 lb. per yard, with the head ⅞ in. below the head of the larger rails. The flangeless wheels ran upon these lower rails, the ordinary rails forming the inside guard. The front part of the wagon was supported on a fore-carriage, which could either be pinned or allowed freedom of motion as in an ordinary road vehicle. There was a single central coupling arranged to engage in a jaw on the fore-carriage, so as to guide it when not pinned. Shafts were attached to the fore-carriage when the wagon was to be used on the ordinary roads. The wagons were of sufficient strength to carry a load of 2 tons, and their weight without the shafts was 23¼ cwt. Experience had

shown that the wear and tear, both on the wheels and rails, was not excessive, and that the traction did not much exceed, if at all, that of ordinary trucks with flanged wheels. No difficulty had been found with the horse-traction on ordinary roads, and the taking on and off was conducted with great rapidity.

Each locomotive-car was fitted with an Edison-Hopkinson dynamo, which was geared by means of helical-toothed wheels, and a chain to one axle of the bogie. The special construction of driving chain, rendered necessary by the severe conditions under which it had to work, was fully described. The trains were commonly composed of one locomotive-car and three or four trucks; but frequently a second passenger-car was coupled, or the number of trucks increased to six. Thus a gross load of 30 tons was constantly drawn at a speed of six or seven miles per hour, on a gradient of 1 in 50. The cars could be reversed by reversing the current through the motor without change of lead, but as there was a loop at each end of the line, reversal was only required when shunting in the sidings. The terminal loop-curves were of 55 ft. radius only, but these were traversed by the long locomotive cars with perfect ease, to which the method of carrying the motor-dynamo on the bogie largely contributed.

The author concluded the paper with a discussion of an extended series of experiments to determine the efficiency of the whole combination under various conditions, and the distribution of the losses. The results were illustrated in a graphic form by a series of curves. Under average conditions of working the total electrical efficiency was shown to be 72·7 per cent., the losses being distributed thus:—

Loss in generator	8·6	per cent.
„ leakage	5·7	„
„ resistance of conductor	6·6	„
„ motor	7·7	„

The friction of the bearings in both generator and motor, and the power lost in the driving-gear, were excluded from these results.

In an appendix to the paper the cost of the electrical equipment of the line was summarised, and the cost of haulage per train-mile was shown to have been 3·3d. over one period of five months, when the goods traffic was light, and 4·2d. when the goods traffic was heavier. Since the opening of the line, the locomotive-cars had registered a train-mileage of 40,000 miles, and the tonnage had exceeded 25,000 tons, and the number of passengers 180,000.

The discussion of the paper was adjourned.

It was announced that the Council had recently transferred J. A. F. Aspinall, W. T. Douglass, A.K.C., W. F. Garland, H. A. James, H. Keating, M.A., J. B. McCallum, C. R. Manners, J. Mitchell, W. P. Richardson, F. H. R. Sawyer, and B. Symons, to the class of *Members*, and have admitted Messrs. Alford, Anderson, Anson, Bailey, Baker, Bellamy, Beringer, Body, Bulteel, Chapman (H. C.), Chapman (T. H.), Chiles, Copeman, Cox, Cutbill, Dawson, Dicey, Elsee, B.A., Emerson, jun., Ennis, Fadelle, A.K.C., Furness, Gask, Gostling, Green, Grove, Hamer, Hiscox, Hopps, Jones, Klopp, Lake, La Roche, MacLellan, Malcolmson, Wh. Sc., Marriner, Miller, Millington, Peace, B.Sc., Wh. Sc., Prebble, Ransom, Raves, Reinhold, Revill, Rivers, Roach, Roe, Rome, Saunders, Settle, Sharman, Shepherd, Smith, Starbuck, Stewart, Stowell, Taylor, Thompson, Tragett, Twinberrow (J. D.), Twinberrow (J. W.), Vaughan, Waller, Wentworth-Sheilds, and Woolcock, as *Students* of the Institution.

The first ballot for the Session 1887–88 resulted in the election of E. E. Benest, J. M. Burke, L. M. Clement, G. L. Cook, G. S. Duncan, C. de N. Forman, E. P. Hannaford, R. B. Joyner, J. Lunt, R. Moore, R. H. Ryan, W. Sellers, H. Simon, J. D. Wardale, and C. E. D. Waring, as *Members*; of F. W. Bach, Stud. Inst. C. E., F. O. Baird, R. S. W. Barnes, H. S. Bassett, Stud. Inst. C.E., C. J. Batley, Stud. Inst. C.E., J. J. B. Benson, Stud. Inst. C.E., A. S. Biggart, T. M. Bigley, J. F. Boake, Stud. Inst. C.E., A. L. Buarque, A. H. Campbell, Stud. Inst. C.E., C. A. Carus-Wilson, B.A., A. J. Collin, A. E. Collins, J. M. da Conceiçao, jun., F.P. Cook, Stud. Inst. C.E., F. W. Cross, Stud. Inst. C.E., H. C. Crummack, H. H. Dalrymple-Hay, Stud. Inst. C.E., J. B. Denison, H. H. G. Dunlop, Stud. Inst. C.E., J. H. Duquemin, F. L. Dwyer, B.A., T.C.D., S. C. Early, Stud. Inst. C.E., J. C. Eastham, W. C. Edwards, Stud. Inst. C.E., R. E. Ellis, Stud. Inst. C.E., E. I. Evans, Stud. Inst. C.E., H. S. H. Farrar, T. W. Fowler, K. Fujikura, R. S. Glover, M.E., J. Goodman, Wh. Sc., Stud. Inst. C.E., W. H. M. Greene, J. Harrison, Wh. Sc., H. A. Hill, A. J. Jack, Stud. Inst. C.E., C. C. James, P. B. Jeejeebhoy, H. A. Johnson, Stud. Inst. C.E., J. M. Johnston, J. E. Jones, W. G. Jones, J. P. Knight, Stud. Inst. C.E., G. Lane, J. I. Lawson, Stud. Inst. C.E., E. E. Lefébure, Stud. Inst. C.E., H. H. Leigh, D. M. Litster, J. E. Martin, W. R. Martin, J. A. Maughan, W. O. Meade-King, O. Masayuki, A. G. Nash, B.Sc., T. Old, Stud. Inst. C.E., F. Orton, W. Osmond, Stud. Inst. C.E., W. L. Owen, W. Parry, A. L. Paul, T. T. Prentice, R. Provis, Stud. Inst. C.E., T. E. Quirk, E. Radcliff, F. H. Rees, H. Reeve, T. Reunert, J. H. H. W. Rhodes, R. H. O. Roehricht, J. C. Rolleston, H. Rumsey, W. S. Seaton, A. Sharp, Wh. Sc., Stud. Inst. C.E., P. J. Sheldon, G. T. Sibbering, Stud. Inst. C.E., R. A. Sumner, J. C. Taite, H. B. Taylor, F.C.H., Stud. Inst. C.E., J. H. Thomlinson, W. Thwaites, M.A., E. S. Tiddeman, Stud. Inst. C.E., C. A. Trery, J. E. de Villiers, A. E. Wackrill, Stud. Inst. C.E., C. P. Warde, Stud. Inst. C.E., G. W. Ware, G. K. Wasey, R. Williams, J. A. Wilson, W. G. Wood, Stud. Inst. C.E., V. S. Woods, and J. T. Wynne as *Associate Members*; and of Colonel R. Harrison, R.E., C.B., C.M.G., W. L. Jordan, F.R.G.S., J. B. Morgan, and P. A. Scratchley, M.A., as *Associates*.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

WE take the following from the opening address of the President, Mr. Reginald E. Middleton, M. Inst. C.E., M.I.M.E., read on Wednesday, December 7:—

As the Society advances in years, it becomes more and more difficult for each succeeding President to find suitable matter for his address; so many subjects have been so fully and so admirably dealt with by former Presidents, that he is at his wit's end to discover something new to speak of: at least, I can say for myself that I am in this case. A President must not lecture on one clearly-defined subject, he must deal with things generally; at any rate, this seems to be the accepted rule. I propose to adhere to this rule as closely as possible, but the general theme will be technical education.

Five-and-twenty years ago, when I was learning my profession, the opportunities offered to students were very different from those which are afforded at the present day. In those days public schools certainly, and to a greater or less extent all schools, with a few insignificant exceptions, placed classical knowledge first. Mathematics were taught to a very limited extent, and a knowledge of four books of Euclid, algebra to quadratic equations, and the first rules of plane trigonometry, would carry a boy to a high place in the classes devoted to these subjects. Of modern languages, French and German were indeed taught, but in such a way that 90 per cent. of the scholars had no more useful knowledge of them when they left school than they had when they went to it. In the same manner, an equally superficial knowledge of modern history and modern geography might be obtained, and of drawing; ancient history and geography were important, for a classical education was the beginning and the end of everything, and no boy could rise to any high position in the school without classical knowledge. Engineering classes were almost if not entirely unknown, I do not remember that there was any place twenty-five years ago, where a scholastic engineering education could be obtained, except at King's College.

Now all this is changed; there are many schools of the first order where modern languages, modern science, and mathematics are taught to the exclusion of classical teaching, and where a boy can prepare himself thoroughly for a professional career; though even now sufficient attention is not given to the advantages to be secured by a knowledge of languages; and in this respect we are far behind Continental countries, where, so far as is practicable, an acquaintance with the most important languages of neighbouring countries is compulsory.

In the old days an engineering student went straight from his school education to the office of a civil engineer or surveyor, or to the works of a mechanical engineer; if to either of the former places, his course of study was then much what it is now, he had to take his share of the office work, of the out-door work, and of whatever was going; but he has now the advantage of being able to attend classes which did not then exist. If, however, he goes to the works of a mechanical engineer the case is very much altered. In former days the hours were from six in the morning to six at night, with one hour and a half for meals, and on Saturdays the works closed about four,—thus the actual working hours per week were sixty-one; later this was reduced to fifty-eight, and in some cases fifty-seven hours per week. It will be easily understood that it required a very robust constitution, mentally and physically, and a still more robust determination to succeed, to enable any one who had worked this number of hours in, very frequently, a close and heated atmosphere, to do much in the way of reading afterwards.

In works there was, as a rule, no attempt made to educate the pupils they associated during working-hours with the journeymen, from whom alone they got any instruction; they passed so many weeks or months in a particular shop, handling particular tools and doing such manual work as was given them to do, or in not doing it perhaps, and they became more or less expert handicraftsmen; but no attempt was made to improve their theoretical information,— if they got any it was due to their own exertions.

If a pupil were ever so anxious to read, where, unless he were in a position to buy them, could he get the books? The old Mechanics' Institutes were but indifferently supplied, and neither the present scientific periodicals nor libraries existed.

All this is now changed: the hours of attendance at works are about thirty-six per week, and in many places only a portion of this time need be spent in any particular shop, or in any given work, the rest being devoted to general observation and inquiry; thus the learner is not tired out with manual labour, and has only enough to do to stimulate further research in science. In most if not all the large towns and cities there are good libraries, though these are too often inaccessible to students in the evenings, the only time when they can be useful to pupils who are engaged during the day; there are drawing classes and technical lectures easily obtainable, and instead of there being only one engineering scholastic establishment, there are in or near London alone six such schools of more or less eminence. There are in England ten principal engineering laboratories, namely, in or near London, at University College, at the Royal Indian Engineering College, at the City and Guilds of London Central Institute, and at the City and Guilds of London Institute; in the country there are similar establishments at Masons' Science College, Birmingham; at University College, Bristol; Firth College, Sheffield; the Yorkshire College, Leeds; at University College, Dundee; and at Owens College, Manchester. The City and Guilds of London Institute is establishing branches for technical information in all the principal towns, and engineering degrees can be obtained at some of the Universities.

Many prizes and scholarships are given every year to engineering students, and they are encouraged in every way to add scientific knowledge to the practical requirements of the profession; indeed, there is some danger that the value of a scholastic education may be exaggerated at the expense of the practical training. Far be it from me to in any way belittle scientific knowledge, what I have already said of the advantages enjoyed by the younger engineers is proof to the contrary; but the scientist is apt to be a theorist, and to trust to his theoretical knowledge and to that only, and in this case he will not be a reliable engineer; to be such, a man should be a combination of the practical man and the scientist, a combination not often found.

Scientific knowledge is the result of practical experiment reduced to figures, and of theoretical deductions from such data reduced to practice; but the complexity of many conditions of forces is so great that it would take a lifetime to formulate them accurately; therefore the practical man takes in such cases the knowledge gained by experience, which he knows to be safe, even though he may thereby use more material than is necessary.

The excellence of a piece of work, apart from artistic considerations, must be judged by the standard of its suitableness for the duties it has to perform, and secondly by its cost; if then critical examination into dimensions increases instead of reducing the cost of a piece of work without adding materially to its usefulness, it is unnecessary and wasteful; if it both increases the cost and reduces the efficiency it is altogether harmful. If it were possible in this country, as it is to a considerable extent possible in America and the Colonies, to have standard types for bridges, then it would be useful and right to go to the utmost refinements in the calculations; for as the conditions of working would be in all cases similar, so, having once produced the best type, the dimensions would be proportional and follow one certain rule, and the calculations would not have to be repeated; but the requirements in this country are varying, and the question cannot be treated on the same basis. Still, I believe that much might be done in this direction for the simplification of bridge designing, and especially for colonial work, and that we should individually and collectively benefit thereby; and I am quite certain that the system of working to standard is much neglected in this country, and that the con-

struction of machinery generally would be much advanced by its careful adoption. Though technical education has made such strides in the last few years, there is still much to be done. We have several first-rate engineering laboratories, but they are not open to the profession; the Institution of Mechanical Engineers have made inquiries into the strength of materials, of riveted joints, and other questions of interest; but, speaking generally, the carrying out of experiments is confined to manufacturers, contractors, and others, who have large means at their disposal. As a rule, the makers of experiments are quite willing to publish them; but, in my opinion, it should be possible for all men to experiment at a merely nominal expense in establishments provided at the public cost and under the guardianship of the scientific institutions of the country. The making of experiments is not a simple mechanical matter, to be done by any one; not only is the greatest care required in correcting and tabulating results, but a direction is also necessary. A man may have every facility to hand and give his life to the work, and yet produce little or nothing worth recording; while another man who has not these facilities might, if he had them, afford very valuable information to the world. Experiments, if made at the public expense, would, of course, be public property. Exhaustive information is required in ventilation, which is little understood, on the behaviour of materials as affected by fatigue, on the flow of fluids, and many other subjects. All these questions are, no doubt, being investigated by individuals; but such investigation by single persons is very apt to be directed only to support some already preconceived idea, and experiments carried on by several experimentalists in a public laboratory would, in my opinion, afford a more satisfactory and reliable result in a shorter space of time.

A meeting was held a short time back at the rooms of the Society of Arts to discuss the advisability of the promotion of technical education, when amongst the speakers were Lord Hartington, Lord Rosebery, Sir Lyon Playfair, Mr. John Morley, Sir Bernhard Samuelson, Sir John Lubbock, Mr. Acland, Professor Stewart, and others, and the conclusion arrived at by all the speakers was, that if we are, not only to retain, but to extend, our hold on the commerce of the world, greater facilities must be given for technical education. It was stated at the meeting, and my own information on the subject fully bears out what was said, that although English workmen are, as a rule, fully as well educated for their several occupations as their fellows on the Continent, yet technical education there is progressing relatively more rapidly than it is here, and that wherever its standard is highest, there also is the rate of wages increased; and therefore if we wish to maintain and improve our commercial position, so also must we improve our own technical knowledge and that of our workmen, both for their sakes and our own. As regards commercial technical knowledge, the opinion expressed is not so favourable to this country as that already recorded; it is said that our manufacturers are not as ready to adapt themselves to the requirements of different countries as are those on the Continent; that they do not provide full information as to their manufactures in the language of the country where they wish to make sales; that their agents are frequently ignorant of the language of the country and the business habits of the natives; that they do not exert themselves to the same extent or live such steady lives as the agents of German houses, for instance. One consequence of this is that English houses have employed German agents abroad, who have worked well for their employers for a time, but who have, when they got firm hold of the business, transferred their services to their own countrymen resident in their own country. This remark is worthy of notice; for I understand that German firms doing business in England are subject to exactly the same treatment as their English rivals, and that they now find that they, as well as the English firms, cannot safely employ Germans as their agents; if they do, they are liable to find their business transferred to the Fatherland, With regard to the technical education of workmen, it is right and necessary that even greater facilities should be afforded for their information; but the best results will not be obtained until the trades unions recognise the fact that to bring men to one uniform level of wage, whether that level be high or low, is not the way to benefit their constituents nor the country; nor does it conduce to obtaining or retaining good workmen. If there be a uniform rate of wages in any branch of any business, the tendency must be to produce stagnation; no man has any inducement to excel in his work; and if his personal character be such that he feels he must excel, whether he be paid for it or not, he naturally looks out for some other country where his abilities may have free scope, and we thus lose our best men and only keep those who are mediocre. If a man might look to rise to be foreman or manager through the excellence of his labour, this might be sufficient inducement to cause him to do his best; but a good handicraftsman is not necessarily, or even frequently, a good foreman or manager.

When the trades unions, or the men who compose these trades unions, are alive to the fact that to insist on one uniform level rate of wage is to destroy and enervate the energies of the men, to make the prime cost of manufacture higher, and therefore the rate which manufacturers can afford to pay for wages, lower,—that the only stimulus which it affords is to the manufacturer, to cause him to produce or obtain machinery which will do the work as well as the men will, and which can be managed by labourers at a further reduction in the wages rate,—when they see that it is to their interest, and is, in fact, necessary to their existence, that better work should be done at the same or a lower price, though possibly at a higher wages rate, in order to increase the output by improving our markets,—then we shall not only pick up any leeway we may have lost, but shall more than retain our commercial position amongst the nations, but not sooner.

The same remarks apply to a uniform number of hours worked: this practice must also produce stagnation, for the strong man gains nothing by his strength, just as with a uniform rate of wages the clever man gets nothing for the use of his brains, or the industrious man for his industry. Working fewer fixed hours must also reduce the wages rate, for no manufacturer can afford to pay the same wages when his machinery runs only for eight hours as he can when he can run it for ten hours or longer. Mechanics in America no doubt receive higher wages than are given in this country, but they work far longer hours for this wage than our workmen do, and in most places the cost of living is far greater than it is here.

ENGLISH BRICKMAKING PLANT IN GERMANY.

THE HENNIGSDORF BRICK AND TILE WORKS, NEAR BERLIN.

The following is a translation from the *German Brick and Tile Gazette* of November 11th:—In the 25th number of our Journal for the year 1884 we gave a description and prospective sketch of the Hennigsdorf steam brickfield. For the benefit of those of our readers who have not seen that number, we give a short *résumé* of the article referred to. The Hennigsdorf brickfield lies about ten miles north-west of Berlin, on the right or western bank of the navigable river Harvel. The raw material which is used in these works is a hard marly clay, and cannot be used without being washed. The yearly make of the brickfield is at the present time about six millions of ordinary German bricks, of which two-thirds are hard-burnt and selected qualities for ordinary buildings, and one-third are facing and moulded bricks of a lemon yellow colour. The bricks are burned in two newly-built ring-kilns with eighteen chambers each, and in two German kilns; and the manager, Mr. A. Sandner, has been able to reduce the number of wasters in the ring-kilns (which, with these light-coloured bricks is always very high unless great care has been exercised) to from 1½ to 2 per cent., and the breakages to from 0·7 per cent. to 1 per cent. The bricks are manufactured partly by hand and partly by machinery, the washed clay having been previously prepared in pug-mills, of which there are seven in one long row. The material which is fed into these pug-mills is taken from the slurry backs, of which there are 120, each having a capacity of 300 cubic yards. Before the material is dry enough for use it must remain in the backs from six to eight weeks, as the water is removed entirely by the action of sun and air, though the sandy bottom materially assists in the process. The clay, obtained from a distant clay-pit, has until now been washed on the brickfied by six ordinary wash-mills. The plant is so arranged that the four kilns, with their coal sheds, lie nearest the Harvel, leaving ample room, however, for stacking the finished bricks on the water's edge. To the westward of the kilns or further from the Harvel are twenty-one drying-sheds, each capable of containing 30,000 bricks. These sheds are built parallel to each other with their ends towards the river, and in the centre of them stands a massive machine pressing house, the upper part of which also carries the shafting and pulleys for transmitting power from the engine to the pug-mills. North and south of this pressing house are respectively three and four pug-mills, which are spaced 66 yards apart, and are arranged parallel with the gable ends of the drying sheds. About 100 yards further westward are the engine and boiler houses, and to the north and south of these stand the wash-mills, three on each side, in a parallel line to the pug-mills, and about the same distance apart. Power is transmitted entirely by wire ropes from the engine to the wash-mills, and also to the pug-mills, through the press-house, as already described. The clay-pit, of colossal dimensions, whence the raw material is obtained, lies four miles to the north of the brickfield, and is connected with it by a narrow-gauge railway. The filled trucks were drawn by a small locomotive, built by Krauss & Co., of Munich, to the brickfield, where the material was stored near the wash-mills, for further use, as required. The great cost which this mode of transport involved, and which was chiefly due to the fact that the Government only allowed the line to be used in the winter months, and to the heavy repairs to the permanent way, caused the owners of the brickfield, at Mr. Sandner's suggestion, to remove the washing plant from the brickfield to the clay-pit, and to bring the washed material in a pipe line direct to the slurry backs at the brickfield. The new slurry plant in the clay-pit, including the pumps, has been supplied by Messrs. Taylor & Neate, of Rochester, England, who make a speciality of the erection of such machinery, and has now been successfully at work for three weeks. Accepting the kind invitation of Mr. Sandner our correspondent visited the brickfield and clay-pit on October 31st last, and the following description of the new machinery is compiled partly from personal observations and partly from information kindly supplied by Mr. Sandner. After a short inspection of the brickfield a special train, consisting of a small open omnibus drawn by the above-mentioned locomotive, took us to the clay-pit in thirty minutes. The slurry plant itself consists of a single wash-mill erected on the lowest point of the clay-pit, similar to that illustrated by us on p. 549 in 1886, only the Hennigsdorf mill has six horizontal arms and three harrows slung by chains, the tynes of which drag through and stir up the clay. The diameter of the wash-mill pit in which the harrows revolve is 20 ft., and its depth is 4 ft. 3 in. The material is shot into the mill from barrows, while water is added in a continuous stream, and so regulated that the slurry to be transported consists of one part clay and two parts water. This slurry passes through a fine grating, which keeps back the coarser portions, &c., and then runs into a large sand trap which lies a little lower than the wash-mill floor where it deposits the finer particles of sand, and then flows on to the suction pit of the pumps. The wash-mill normally makes twelve revolutions per minute. The slurry is then forced by the three-throw pumps through a cast-iron pipe line four miles 670 yards long. The pumps, which are of the plunger type, have a normal speed of twenty-one revolutions per minute, and a 15-in. stroke; a pressure gauge is fixed in connexion with the air vessels, which registers the pressure in the pipes. The pressure with slurry of the above-mentioned thickness (that is 1 part of clay to 2 parts of water) amounts to between 120 and 135 pounds per square inch, but a larger proportion of clay increases the pressure, and a less proportion of clay reduces it. A specific gravity tube is used to determine the proper consistency of the slurry and should register "12 B" when the correct thickness is arrived at. The motive power for the whole plant, that is for the slurry pump, water pump, and wash-mill is furnished by a semi-portable compound engine by R. Wolf, of Magdeburg, and is

transmitted by leather belts. At the present time the actual output, which can at any time be considerably increased, is 390 cubic yards of slurry, or 130 cubic yards of solid clay per day, or 39 cubic yards of slurry per hour, and the velocity in the pipe line is 30 in. per second. The pipe line, which is 5 in. diameter, has been laid so that the gradient changes from rise to fall every 550 yards throughout the whole distance. Rather more pressure is required for this arrangement, but it has the advantage that in case of breakage a small section only need be emptied, and for this latter purpose inspection pipes with two doors each have been fixed in strong brick pits every 550 yards. At the end of this pipe line are a series of distributing pipes with sliding sluices, so that the slurry can be sent to the north or south divisions of the slurry back as required. The new plant has now been working perfectly satisfactorily for three weeks, the few small difficulties incident to every new undertaking having all been overcome, and having been chiefly due to the bursting of defective pipes. The entire cost of the plant, including the pipe line, has been about 3,700*l.*

COMPETITIONS.

Baptist Church, Moseley-road, Birmingham.—After a year's consideration, and with professional assistance, the committee of the above church have, we are informed, selected Mr. Ewen Harper, architect, of Birmingham, to carry out the work, at a cost of about 4,000*l.* The other competitors were Mr. J. A. Cossins, Messrs. Ingall & Son, Mr. Hughes, Mr. Sutcliff, and Mr. Newton.

Heating and Ventilation, Congleton Town-hall.—In the competition for heating, ventilation, &c., of these buildings, the plans of Messrs. Sugden & Son, architects, Leek, have been awarded the first premium.

Wesleyan Chapel, Blackpool.—A new chapel is to be built for the Wesleyans at South Shore, Blackpool, and a number of architects were selected to submit designs for the same, the result being that the drawings prepared by Mr. J. H. Burton, of Ashton-under-Lyne, were adopted by the unanimous vote of the Trustees.

"TOBOGGANING SLIDES" AND THE BUILDING ACT.

ELKINGTON *v.* SMEE.

THIS was a case (heard in the High Court of Justice, Queen's Bench Division, before Mr. Justice Wills and Mr. Justice Grantham) stated by Mr. Biron, the magistrate sitting at Lambeth Police Court, and raised the question whether a "tobogganing slide," erected in the grounds of the Crystal Palace, was a building within the effect of the Metropolitan Building Act, 1855, so as to make it necessary for notice of the erection of the structure to be given to the district surveyor under section 38 of that Act. The respondent was the builder of the slide, and the contention on his side was that the slide was not a "building" within the meaning of the Metropolitan Building Act, or, if it was, it was exempted from the operation of that Act by section 21 of the Crystal Palace Company's Act, 1881, which provides that "the main building, conservatories, and waterworks of the company, and the conveniencies, and other works immediately connected therewith shall be exempted from the operation of part 1 of the Metropolitan Building Act, 1855." But the section adds, that "this exemption shall not extend to any dwelling-house or building except as aforesaid upon any part of the property of the Company." The toboggan slide was erected by a company called the Tobogganing Company, under an agreement with the Crystal Palace Company, by which the former company received a bare licence to enter on the premises and erect the slide, the Palace Company receiving one-tenth of the net receipts. The slide and the structure connected with it were detached from the main building of the palace, and comprised besides the slide, 426 ft. in length, a pavilion at one end, 63 ft. long, part of which was occupied by an engine-room with brick walls and concrete foundations and roof, containing the engine used to work up the empty sleighs. The magistrate held that the structures were "buildings" within the meaning of the Metropolitan Building Act, but were also within the exemption of section 21 of the Crystal Palace Act. He accordingly dismissed the summons against the respondent for not giving the notice above-mentioned.

Mr. Horace Avory appeared for the appellant; and Mr. Murphy, Q.C., and Mr. Wildey Wright for the respondent.

After some argument upon the terms of the Acts, The Court allowed the appeal, holding that the structure was within the Metropolitan Building Act, and not within section 21 of the Crystal Palace Act. The case was accordingly remitted to the magistrate.—*Times.*

THE PERSPECTOGRAPH.

SIR,—Mention being made of the above instrument in your leading article of the issue of the 3rd inst., I would, with your permission, make a few remarks on the subject.

I have used an apparatus of this kind during the last four years, and made a considerable number of perspective outlines with it. I have it in daily use still, and shall be glad to explain its working to any one who takes an interest in this matter.

The Perspectograph produces a pencil outline, which, of course (in common with all outlines), "must be finished by an artist." A very clever perspective draughtsman may do the outline just as good, but not better, as the outline made by the instrument always is perfectly accurate, and no one can do it as quickly without sacrificing a great amount of accuracy.

Although the Perspectograph is neither so complicated as is generally thought, nor difficult to work, it has the disadvantages of being delicate, expensive, and requiring much floor-space, for which reasons it is not suitable for general office use.

C. W. ENGLISH.

PROVINCIAL NEWS.

Birmingham.—We hear that extensive additions and improvements to the Queen's Hospital, Birmingham, are to be made, at a cost of 5,000*l.* to 6,000*l.*, and that the committee have called in the assistance of Mr. Ewen Harper, architect, of Birmingham.

Farnborough. — The Farnborough Hydro-Therapeutic Establishment was formally opened a few days since. The baths, which are attached to the Queen Hotel, Farnborough, are designed for the treatment of chest diseases, rheumatism, gout, and kindred complaints, on the Pine system, now so much in vogue at Reichenhall, Ischl, Baden-Baden, Homburg, and other German spas. The building consists of special inhalation rooms, robing rooms, and baths, for the treatment of the various diseases for which Pine extracts are used. Attached to the establishment are complete Russian vapour and Turkish baths, fitted up with special douche and spray arrangements. The cooling room or lounge is divided into cubicles for the use of bathers who desire privacy. The steam-heating, water supply, and pumping arrangements, as well as the special fittings, were intrusted to and carried out by Mr. John Smeaton, of Great Queen-street, London. Messrs. McWilliam & Sons, of Bournemouth, were the builders. The baths are formed of glazed brick throughout.

Moreton-in-Marsh.—On the 2nd inst., the Rt. Hon. Sir Michael Hicks-Beach formally opened a public hall in Moreton-in-Marsh as a memorial to the late Earl of Redesdale. It is the gift of Mr. Freeman Mitford, C.B., and is Tudor in style. It is built of local stone, from the quarries at Bourton-on-the-Hill. The hall is 70 ft. by 25 ft., and is panelled with oak up to the height of about 4 ft. At the north end is a daïs a few inches above the floor level, and at the other end the approach from a solid oak staircase is shut off by a carved oak screen, while above is a small gallery. The roof is supported by carved oak beams, and is roofed with Dean Forest slabs, and in the centre there is a clock-tower surmounted by a vane. The architects were Messrs. Ernest George & Peto, of London, the builders being Messrs. Peto Bros., also of London.

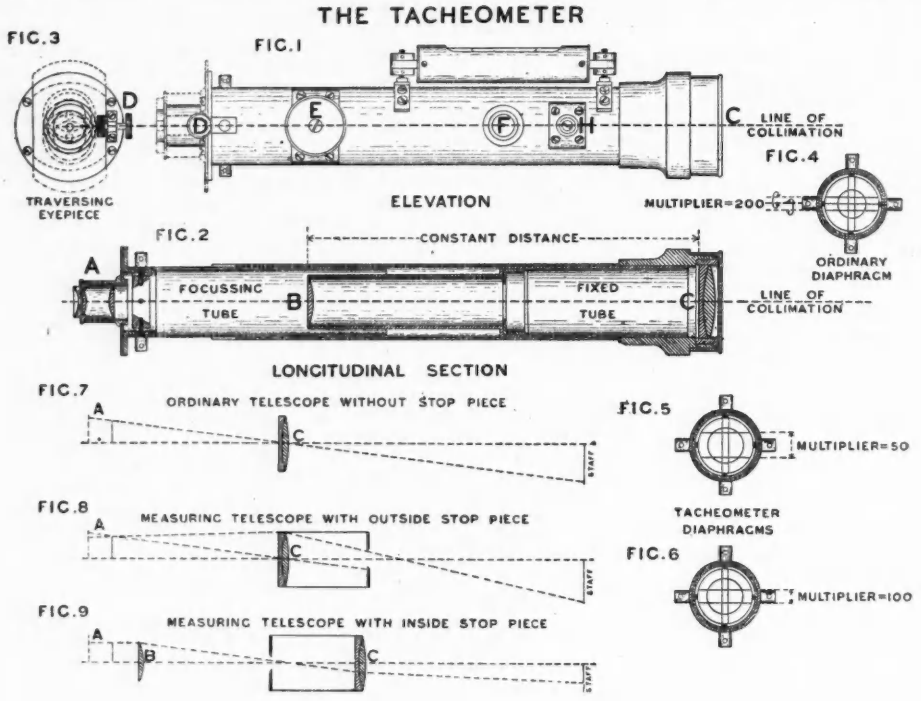
St. Helens.—The extensions of the St. Helens Corporation Gasworks are so far completed that on the 16th ult. gas was being made in the new retort-house. Prior to the commencement of these extensions, gas was made in a house containing seven arches, each arch having fourteen retorts capable of producing altogether 800,000 cubic feet of gas per day. From the retort-house the gas passes through a condenser to be cooled, then through a scrubber into the purifying-house, and through meters to the holders, from which it is distributed by mains throughout the town. The new works, so far as they are completed, include a retort-house 183 ft. long by 65 ft. wide, which will hold 212 through retorts, the generator furnaces for which have been erected from the designs of Mr. C. C. Carpenter, of Vauxhall, London. There are 424 mouthpieces. They are charged by West's patent machine. When in full operation it is estimated that 1,250,000 cubic feet of gas per day will be made, and the old retort-house will be converted into a purifying-house, the present one being inadequate. Up to the present the cost has been about 15,000*l.*, which is lower than the original estimate. The remainder of the works, which will cost about 8,000*l.*, will not be completed until next year.

West Bromwich.—Last year plans were prepared for rebuilding the receiving wards of the Union workhouse, and for providing a new building for the accommodation of vagrants as well as for a new Board-room and Union and relief offices. These buildings have just been completed, at a cost of about 11,000*l.*, and were formally opened on the 18th ult. The recent works included the removal of the old dilapidated receiving and vagrant wards, by which space has been obtained for the new receiving wards and for the opening out of a roadway along the front of the master's residence, from which easy access is obtained to the several departments of the workhouse. The receiving wards for men and women are placed on either side of the porter's lodge, adjoining the principal entrance from Hallam-street. Each contains receiving, day, and sleeping-rooms, bath-room, lavatory, and clothes store. The vagrant department is now entirely detached, and placed on the Lyndon side of the workhouse premises. It includes a residence for the labour master, he and his wife respectively having control of the male and female vagrants, who are accommodated in distinct buildings, on the combined separate cell and associated ward system. The new Board-room, union and relief offices occupy a position slightly to the south of the main entrance, and are a prominent feature in the Hallam-street front. They form a detached block of buildings. Gas is laid on throughout these buildings, the fittings being specially made by Messrs. Best & Lloyd, of Cambray Works, Handsworth. The furniture throughout has been manufactured by Messrs. Marris & Norton, from designs by and under the superintendence of the architects, Messrs. Henman & Timmins.

Working Hours on the Railway.—It is a matter of notoriety that some of the most pronounced examples of overwork have been, and continue to be, furnished by the experience of railway *employés*. That accidents occur from time to time which are more or less directly attributable to mismanagement in this particular is not remarkable. The wonder rather is that we do not oftener hear of them. We are not ignorant that on the railway the observance of a settled scale of working hours is at times a somewhat difficult matter. The length of journeys, unexpected delays from weather and the like, the utility of special aptitudes possessed by particular men and required at a given time, are some of the circumstances which may render the due allotment of time for purposes of work a matter for careful consideration. When, however, we find men employed on trains in the most responsible positions for more than thirty hours at a stretch we are surely justified in crediting their superiors with most culpable negligence. Necessity is said to have no law, and on this principle it seems to be assumed that the driver of a locomotive should be virtually a part of his machine. We fail to see the point, and the public, we are assured, will hardly allow that the personal risk which they incur by such a proceeding can be excused by the maintenance of a solid dividend for the benefit of shareholders. What is wanted is a larger staff of subordinate officials, who shall be available to relieve one another at reasonable intervals. An ordinary working period of twelve hours per day is, we take it, sufficiently long for this class of workmen, as well as for artisans engaged in other occupations.—*Lancet.*

The Electric Light in India. — The electric light has been introduced into the East Indian Railway collieries, at Giridhi, by the manager, Mr. Walter Saise, M.Inst.C.E., F.G.S., and marks the opening of a new era in Indian mining. The machine used is a 30-lamp dynamo, worked by a 2½-horse-power vertical engine, which is supplied by steam from the pit-winding engine boilers, so that the cost of working is practically *nil*. The lamps are of the usual incandescent form, with carbon filaments in hermetically sealed vacuum globes, which give a brilliant, steady light. The miners are said to be delighted with the innovation, and go to their work with greater confidence than before.—*Indian Engineer.*

THE TACHEOMETER



ECKHOLD'S OMNIMETER

FIGURE 10

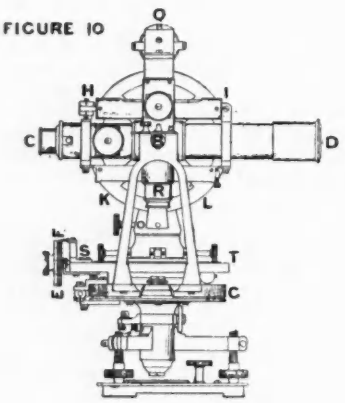


FIGURE 13

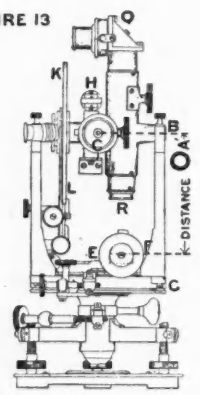
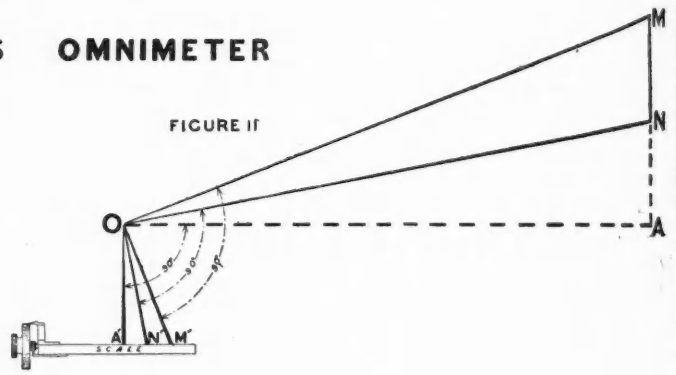


FIGURE 11



$$OA = \frac{MN \times OA'}{M'N'}$$

$$AN = \frac{MN \times A'N'}{M'N'} = \frac{A'N' \times OA}{OA'}$$

$$OA' = \frac{MN \times OA}{MN}$$

FIGURE 12

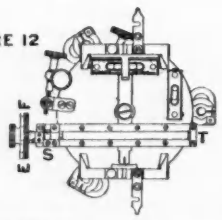
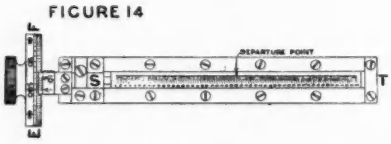


FIGURE 14



The Student's Column.

LAND SURVEYING AND LEVELLING.

XXV.—DETERMINING DISTANCES.

THE Tacheometer (figs. 1 to 6) and the Omnimeter (figs. 10 to 14) enable the surveyor to determine the horizontal distance of a point from either instrument by means of a vertical measurement read off a level-staff. In the tacheometer two parallel horizontal wires are placed in the diaphragm at a given distance from each other and at equal distances from the central horizontal cross wire which appears in a level. If, as in fig. 6, the distance apart of the two parallel wires from each other be one-hundredth of the focal length of the object-glass, every foot which is read upon the level staff will represent 100 ft. of horizontal distance when the instrument is set up and its telescope adjusted in a level position. In the same manner, 2 ft. read upon the staff would represent 200 ft. of distance. Figs. 1 and 2 show the special form of construction recommended for tacheometers, but it is manifest that the diaphragm arrangement could be easily added to any levelling instrument simply by inserting two extra cross-hairs at the correct distance apart. The diaphragms in figs. 5 and 6 omit the central horizontal cross-hair used for taking levels, as shown in fig. 4. In fig. 4 the cross-hairs are fixed so as to record a horizontal distance of 200 times the height read upon the staff; fig. 5 is set to record 50 times, and fig. 6 100 times the distance. The eye-piece, as shown in fig. 3, is fitted with a slide and rack so as to be traversed up and down to the positions shown by the dotted lines, by turning the milled-headed screw, D. The diaphragm itself remains fixed. A tacheometer is almost invariably made with a three-screw tribach, but in the Continent, where a three-screw base is preferred.

Fig. 7 shows an ordinary telescope without a stop-piece, in which the angle between the inclined line and the horizontal has not a constant value for different relative positions of the eye-piece and the object-glass. The introduction of the stop-piece in figs. 8 and 9 serves to maintain a constant value, but by thus choosing certain rays and rejecting others, the effective power of the object-glass becomes diminished: hence the object-glass is made large in order to balance this defect by allowing more light to enter the telescope. The measurement is calculated from the centre of the instrument in both the tacheometer and the omnimeter.

The Omnimeter (figs. 10 and 13) has a powerful microscope, Q R, permanently fixed at right angles to the telescope, C D. Both microscope and telescope move upon the same axis at right angles to one another in every position. Thus the line through the centre of C D is always perpendicular to the line through the centre of Q R. Hence, in fig. 11, if M A represent the central portion of a level staff, the distance O A can be calculated from the readings given by the scale (fig. 14), coupled with the difference of the divisions read upon the staff (fig. 11), thus:—

$$O A = \frac{M N \times O A^1}{M^1 N^1}$$

$$A N = \frac{M N \times A^1 N^1}{M^1 N^1} = \frac{A^1 N^1 \times O A}{O A^1}$$

$$O A^1 = \frac{M^1 N^1 \times O A}{M N}$$

The scale (fig. 14) is placed in fig. 10 at S T (see plan in fig. 12). This scale is usually 4 in. in length, divided into 100 equal parts, the principal divisions being pointed out by numerals engraved over or near them, so as to be readily read by the microscope Q R, and each of these 100 parts is halved by an un-numbered line, so that the whole scale is divided into 200 equal parts. By the addition of a micrometer screw, E F, the scale can be moved backwards and forwards exactly one of these 200 subdivisions. The circle E F of the micrometer screw is further divided into 100 equal parts by lines properly marked and numbered. Each of these 100 parts is divided into five equal parts by means of an attached vernier (see fig. 14). Hence the 4-in. scale S T is accurately and visibly divided into 100,000 equal parts.

Books.

Vestiges of Old Newcastle and Gateshead. By W. H. KNOWLES and J. R. BOYLE. Newcastle: Andrew Reid. (In progress.)

THIS is the first number of a publication intended to be completed in twenty parts, giving sketches and historical notes of buildings of old Newcastle and its neighbourhood. The vignette shows a charming bit of picturesque street building, "No. 37, The Side." This quaint name originated from the street being on the side of the hill on which the castle stands. Three full-page plates are given, including one of the well-known "Black Gate" leading into what was once the castle precinct. The notes of local history and tradition are interesting and well written.

A Handbook for Steam Users, being Rules for Engine Drivers and Boiler Attendants. By M. POWIS BALE, M.I.M.E., A.-M. Inst. C.E. London: Longmans, Green, & Co.

THIS book consists of a number of rules or hints on various subjects connected with steam machinery. The whole is arranged in four chapters, but each subject is treated separately and independently under a distinctive heading. There is a legitimate scope for such a book, and the author has executed his task in a satisfactory manner. Even practical men of long experience, who know all about the matter to begin with, may find in glancing through the pages of the book useful reminders on things not often put in practice, even if known. There would be far fewer machinery accidents if the teachings enforced by Mr. Powis Bale were more scrupulously observed.

The Brassfounders' Manual. By WALTER GRAHAM. London: Crosby Lockwood & Co.

THIS is a seventh edition of a small manual which first saw the light over twenty-five years ago. In the year 1861, no doubt, it was a meritorious publication, but it has not been brought up to date in the last edition.

Pneumatics, including Acoustics and the Phenomena of Wind Currents. By CHARLES TOMLINSON, F.R.S., F.C.S. London: Crosby Lockwood & Co. 1887.

THIS is a fourth edition of a small handbook that has been for some years before the public. It is of an elementary character, and possesses the merit of being expressed in clear and simple language, which renders it especially fit for the instruction of young persons. A large part of the book is naturally devoted to the barometer, the necessary points to be observed for obtaining a good and reliable instrument being set forth. The causes of winds and atmospheric phenomena are also discussed. Another section of the book treats of the propagation of sound, and its reference to musical intervals. An appendix deals in detail with such matters as the anemometer, air-pump gauge, the glycerine barometer, and the Springel pump. There are also some remarks on weather forecasts. There are several illustrations of the usual type, but no index.

The Portable Engine; its Construction and Management. By WILLIAM DYSON WANSBOROUGH. London: Crosby Lockwood & Co.

THIS is an interesting little book, treating of a subject of no little importance, with which the author has a practical acquaintance. It is intended for "owners and users of steam engines generally," and Mr. Wansborough sticks creditably to his text without wandering too far into those more abstruse problems that may be supposed to appeal more especially to manufacturers and designers. The historical data contained in the preface are interesting. The credit of originating the portable engine is accorded to Richard Trevithick; although the creation of the versatile Cornish miner bore little more resemblance to the modern portable than the engines of the *Comet* to those of a torpedo boat.

The book opens with an elementary description of the high-pressure steam-engine and the locomotive boiler. All we have to find fault with in this are the terms. For the expression "high-pressure" should be substituted "non-condensing." Now, when we have marine condensing engines working with an initial pressure of 180 lb. to the square inch, it is time the use of "high-pressure" should become obsolete as a distinctive definition of engines often working at lower pressures. Many non-technical readers, especially, no doubt, those of agricultural pursuits, will thank the author for his explanation of mechanical draughtsmanship by aid of such familiar objects as a cup and saucer and tea-spoon. "Units of Connexion" is the title of an excellent chapter full of information for the tyro. Under the head of "Construction" the engine and boiler are dealt with in two separate chapters also capable of instructing any person of ordinary intelligence on the main features of the subjects treated of.

Perhaps, however, the bucolic section, which should supply a large contingent of Mr. Wansborough's readers, may find "$d = \sqrt{\frac{S\,D}{C}}$" a little puzzling, but application to the nearest schoolmaster would, doubtless, put matters in a clearer light. But when we come to "the slide valve and its action," and find ourselves plunged into Zeuner's graphic theory, it is, perhaps, necessary to qualify what has been said above about the author sticking to his announced intention. We fear that here the average village schoolmaster will hardly be able to pull our agricultural friends through, but they can take refuge in a comforting alternative of skipping without, perhaps, losing much of practical importance; although, of course, we by no means wish to undervalue Zeuner's beautiful expositions when in their right place. A short chapter on the indicator diagram follows, and the book concludes with "Hints to Purchasers."

There are a great many excellent illustrations. In these a preference is shown for the designs emanating from a limited source; but they are, doubtless, none the less valuable on this score.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

176, Ventilating Apparatus. T. S. Wilson and H. T. Johnson.

According to this invention an improved apparatus is fixed in the chimney-breast for ventilating apartments. The combination with one or more gas or atmospheric burners with a chimney open at both ends, and enclosed in a cylindrical shell open at the bottom, and with its upper part bent backwards and opening into the flue, the whole being enclosed in a casing (fitted in the chimney-breast), is claimed. Open louvres or perforations admit the air from the apartment, and an aperture at the back near the top allows the exit of air into the flue.

437, Chimney Cowls. J. D. Thompson.

Double cones, with annular sheet metal ring cones, are the chief features of this invention, which is for the purpose of preventing blow down in shafts or chimneys.

743, Ventilating Apparatus. E. J. Dive.

This apparatus is composed either of two plates capable of sliding one upon the other, or of a panel provided with a certain number of holes which can be uncovered at will by means of a plate actuated by a cord, the said panel being placed at any point, to establish communication with the outer air. The holes which convey the air from the outside are placed in an oblique direction, so that the air rises to the ceiling and becomes slightly heated before spreading in the apartment.

6,307, Improved Water Tap. E. Zahn.

The outlet is either in the shape of a V or half-ball, and the spindle of the valve is placed directly over it. The valve itself is of the same shape, and the valve spindle and handle are attached to each other, and move in a horizontal position. The upper part of the spindle passes through a stuffing-box. The means employed to open the tap are wheels or rollers attached to the valve, which, by a turn of the handle, will carry the valve out of its resting-place; the wheels rolling up in a groove in the outer case.

10,636, Draught Regulators. T. Baker.

The draught regulators are made so as not only to come down from the top of the fireplace as an ordinary blower, but two side fan-like pieces are fitted which, when drawn forward or downward, induce so great a draught that even inferior coals may be burnt with a bright glow. The appliance thus fitted also answers as a fireguard, and a convenient and simple covering to the fireplace when it is not in use during the summer months.

12,473, Wood Block Flooring. A. Harrison.

A groove is cut on all four sides, making the lower portion of the block narrower than the upper. As the means of bonding the blocks together, a metal tongue, such as may be made out of ordinary hoop-iron, for instance, is inserted.

NEW APPLICATIONS FOR PATENTS.

Dec. 2.—16,577, J. Tourtel, Automatically Closing Doors.—16,578, S. Bennett, Hoists and Lifts.—16,601, O. André, Glazed Roofs.—16,610, R. Adams, Opening and Closing Swing Windows, Ventilators, &c., and fastening same at any desired angle.—16,619, S. Wilding, Lift or Elevator for Staircases. — 16,621, J. Larmanjat, Moulding, Pressing, and Drying Tiles having inlaid patterns.

Dec. 3.—16,677, E. Nunan, Metal Laths for Building Purposes.

Dec. 5.—16,697, J. Davies, Fastening Door-handles, &c., to Spindles.

Dec. 6.—16,746, W. Watson and J. Judge, Machine for Dressing and Finishing Bricks, Flooring Tiles, &c.—16,769, R. Melhuish, Joiner's Parallel Vice.—16,772, J. Macdonald, Electric Bells.—16,796, H. Lake, Preventing the Slamming of Doors.—16,804, A. Boult, Flushing Cisterns.

Dec. 7.—16,814, G. Parkinson, Syphon-flushing Tanks or Cisterns.—16,819, T. Pease, Curvilinear Door or Gate Hinge.—16,822, J. Smith and H. Geaves, Chimney Cowls. — 16,832, B. Turner, Hydraulic Lifts.—16,839, C. Dungate and E. Clark, Window, Door, and similar Arches, and Ornaments for Building Purposes.—16,848, J. Osgerby, Ventilator and Smoke Curer.—16,858, J. Smith, Ventilating Sewers, Drains, &c.

Dec. 8.—16,877, H. Maxim, Intermittent Water Discharge for Washing out Drains, Water-closets, &c.—16,916, G. Smith, Disinfecting Water-closets.—16,927, T. Ford, Hydraulic Lifts.—16,930, W. Thompson, Floors, Roofs, Ceilings, Partitions, &c.—16,931, J. Gowland, Chimney-tops or Cowls.

PROVISIONAL SPECIFICATIONS ACCEPTED.

13,239, J. Smith, Connecting Pipes.—14,639, H. Alexander, Ventilator for Shafts, Pipes, Roofs, &c.—14,686, A. Crossley, Refractory Bricks, &c.—14,776, S. Timings and S. Hill, Spring Catches or Fasteners for Doors, Windows, &c.—15,173, J. Bean and W. Gaines, Closing Doors and Preventing Slamming of same.—15,197, D. Allport, Lessening the Slamming of Doors, &c.—15,405, W. Yates, Ventilating Fans.—15,483, J. Boulter, Automatic Indicator for Water-closets, &c.—15,666, G. Layton, Manufacture of Cement. — 16,092, J. Hewitt, Glaziers' Wheel Glass Cutters.—7,578, H. Wilson, Window Sash Fasteners.—15,327, M. Eude and A. Buchanan, Iron and Steel Flooring for Bridges.—15,355 and 15,356, A. Patrick, Brickmaking Machinery.—15,467, G. Bulmer, Ventilating Rooms.—15,545, J. Laurence, Bellows Regulators for Water-closets.—15,596, J. MacKnight, Artificial Pavement. 15,769, R. Bucknall, Folding Root Trusses and Pillars.—15,814, J. Carr, Paperhangers and Painters' Combined Paste and Size.—15,926, O. Bowen, Portland Cement.—15,981, J. Earsdon, Double Flush Water-waste-preventing Valve.—16,119, G. Magalhaes, Water-closets.—16,147, H. Munslow, Nails.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

14,142, H. Freese, Wood Pavements.—16,896, J. Fagan, Flushing Cisterns, and Ball-cocks for same.—156, F. Wade, Utilising Wood for Paving, &c.—2,590, E. Poole, Roofing Tiles.—2,657, R. Grocott, Fastening Knobs to Spindles.—14,663, P. Mouw, Guides for Band-saw Blades.—14,973, P. Justice, Imparting Humidity to the Air of, and Ventilating Buildings.—16,171, S. Hazeland, Wood-planing Machinery.—1,927, R. Scott, Decorating Detachable Wall and Ceiling Surfaces.—2,148, W. Bruce, Covering of Walls, &c.—3,889, F. Abbey, Construction of Main Drains, Conduits, or Sewer Pipes.—4,255, M. Syer, Syphon Water Waste-Preventer.—4,544, J. Williams, Metallic Window Sashes and Frames.—8,786, J. Watson, Graining Wood.—8,914, J. Danly, Metallic Buildings.—15,145, G. Denys, Unfastening the Doors of Theatres, &c.—15,211, A. Boult, Wire Lathing.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

DECEMBER 5.

By VENTOM, BULL, & COOPER.

Hammersmith—19, The Broadway, freehold	£4,600
Kensington—28, 29, and 30, Nevern-square, 92 years, ground-rent 78*l.*	5,160
31, 32, and 39, Nevern-square, 92 years, ground-rent 75*l.*	4,715
West Kensington—2, Auriol-road, 82 years, ground-rent 15*l.*	905
4, 6, and 8, Auriol-road, 82 years, ground-rent 45*l.*	2,565
Chelsea—19, Cheyne-gardens, 76 years, ground-rent 11*l.*	1,010
Kilburn—143, High-street, 95 years, ground-rent 25*l.*	1,000

By MURRELL & SCOBELL.

Kingsland—47, Ardleigh-road, 36 years, ground-rent 5*l.*	300
Islington—56, Prebend-street, 49 years, ground-rent 5*l.* 5*s.*	310
Holloway—An Improved ground-rent of 5*l.*, term 74 years	91

By WEATHERALL & GREEN.

Somers Town—14, 18, 19, and 20, Gee-street, 32 years, ground-rent 44*l.*	990

DECEMBER 6.

By W. W. JENKINSON.

Bayswater—77, Linden-gardens, freehold	1,940
West Hampstead—6, Mill-lane, freehold	780
22 and 24, Ravenshaw-street, 97 years, ground-rent 11*l.*	370

ABBEE, RUTTER, & WAGHORN.

Hoxton—30 and 30A, Huntingdon-street, 72 years, ground-rent 8*l.* 5*s.*	700

By E. Richards & Co.
Southgate—14 to 20, 25 to 37, 45, 63 to 67 and 80, Travers-road, 90 years, ground-rent 137*l.* 4s. ... £630

December 7.

By Hobson, Richards, & Co.
Bethnal-green—Ground-rent of 16*l.* a year, reversion in 73 years 355

By A. Robertson.
Camberwell—59 and 61, Church-street, 89 years, ground-rent 55*l.* 1,085

December 8.

By R. Smith & Co.
Huggin-lane, E.C.—3, Paul's-court, freehold 1,000

By Prickett, Venables, & Co.
Stratford—80, Windmill-lane, 52 years, ground-rent 2*l.* 10s. 190
Hampstead-lane—Stabling and outbuildings, 71 years, ground-rent 10*l.* 400

By C. C. & T. Moore.
Bow—147 and 149, Malmesbury-road, 59 years, ground-rent 7*l.* 4s. 585
Harrow-road—21, Church-place, 93 years, ground-rent 4*l.* 500
11, Welling-place, and premises in Kent's-place, 50 years, ground-rent 15*l.* 1,020

December 9.

By Green & Son.
Fleet-street—The Green Dragon public-house, freehold area 1,600 ft. 17,750

By C. & H. White.
Rotherhithe—56 to 63, Adam-street, 50 years, ground-rent 32*l.* 855

By H. Staines.
Kingsland—19, 21, and 23, Bentley-road, 30 years, ground-rent 10*l.* 255
Bethnal-green—6, Matilda-street, 19 years, ground-rent 2*l.* 90

MEETINGS.

Saturday, December 17.

Crystal Palace School of Engineering.—Award of Certificates. 1 p.m.

Monday, December 19.

Royal Institute of British Architects. — Papers on "The Recent Development of the City of Vienna," by Mr. Frederic R. Farrow (Holder of the Godwin Bursary), and Mr. Thomas Blashill. 8 p.m.

Society of Arts.—Mr. H. H. Statham on "The Elements of Architectural Design." IV. 8 p.m.

Surveyors' Institution. — Adjourned discussion on "Allotments." 8 p.m.

Inventors' Institute.—Various papers on "Inventions Suitable for the Household." 8 p.m.

Tuesday, December 20.

Institution of Civil Engineers.—(1) Further Discussion on Dr. Hopkinson's paper on "Electrical Tramways." (2, time permitting) Paper by the late Hamilton Goodall, Assoc. M.Inst.C.E., on "The Use and Testing of Open-hearth Steel for Boiler-making." 8 p.m.

Wednesday, December 21.

Civil and Mechanical Engineers' Society. — Mr. A. T. Walmisley, M.I.C.E., on "The Roof of the National Agricultural Hall, Kensington." 7 p.m.

Royal Meteorological Society.—Four papers. 7 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary meeting. 8·30 p.m.

Liverpool Engineering Society.—Associated *Soirée.*

Thursday, December 22.

Edinburgh Architectural Association.—Mr. P. Geddes on "Architecture and Decoration in their Social and Economic Aspects." 8 p.m.

Miscellanea.

St. Pancras.—The foundation-stone of the new church for the district of Holy Cross, St. Pancras, was laid on the 6th inst. by the Right Hon. G. J. Goschen, on the site in Cromer-street, Gray's Inn-road. The church, which will seat 500 persons, is built in memory of Commodore Goodenough, who was killed on the island of Santa Cruz, and will have a nave, aisles, and chancel, with two small transepts and morning chapel. It will be entered from the west by two porches leading into a narthex forming the baptistry, with four nave arches on each side on Pennant stone columns supporting a lofty clearstory. At the east end will be five lancet windows under deeply-moulded arches, and below, a reredos of alabaster. Under the church will be a large room for parochial purposes and a library. The cost of the building when complete will be 7,500*l.*, but the church proper will be finished first, leaving the lower portions until funds can be obtained. The architect is Mr. Joseph Peacock, the builders being Messrs. Killby & Gayford. It will be of brick, with Bath stone, and the roofs covered with tiles.

Dobcross.—The east window in Dobcross Church, near Oldham, is now filled with a painted window. The subjects represented are the Crucifixion and its antitype, "Moses and the Brazen Serpent"; with figures of St. Mary, B.V., and Our Lord as Prophet, Priest, and King, &c., in the side lights. The window is Classic in style, and the ornament has been kept in sympathy with the architecture of the church. The whole of the work was designed and executed in the studios of Messrs. Heaton, Butler, & Bayne, of London.

Society of Engineers.—The thirty-third annual general meeting of the Society of Engineers was held on the 12th of December, at the rooms of the Society, 9, Victoria-chambers, S.W. The chair was occupied by Professor Henry Robinson, President. The following gentlemen were duly elected, by ballot, as the Council and officers for the ensuing year, viz.:—As President, Mr. Arthur T. Walmisley; as Vice-presidents, Mr. Jonathan R. Baillie, Professor Henry Adams, and Mr. Robert Harris; as ordinary Members of Council, Messrs. R. W. P. Birch, W. N. Colam, W. Schönheyder, W. A. Valon, C. Anderson, J. H. Cunningham, J. W. Restler, and J. W. Wilson, jun., the four latter gentlemen being new Members of Council; as Honorary Secretary and Treasurer, Mr. Alfred Williams; and as Auditor, Mr. Alfred Lass. The proceedings were terminated by a general vote of thanks to the Council and officers for 1887, which was duly acknowledged by the Chairman.—The annual dinner of the Society took place on Wednesday evening at the Guildhall Tavern. Professor Henry Robinson, C.E., the retiring President, occupied the chair, and among those present were Mr. Aird, M.P., Mr. A. Manning, C.E., Mr. W. Airy, Mr. A. T. Walmisley, C.E., President-elect, Messrs. Phillips, Baillie, Birch, R. Harris, C. Horsley, Alfred Williams, hon. secretary and treasurer, and Mr. C. J. Light, secretary. The President, in proposing "Success to the Society of Engineers," said the Society never was in a more prosperous condition nor its work more appreciated than now. The published reports of their Transactions were sought for over the length and breadth of the world. Taking the whole of the year broadly, it showed a successful and altogether satisfactory state of affairs. Considering that it was part of their system to afford to the younger professional men opportunities for educating themselves and gaining experience, he was glad to be able to say that he believed the long period of depression, and probably of disappointment to them, was coming to an end. He believed that for all young engineers who properly qualified themselves and showed an aptness for their profession there was a good future open. Mr. Alfred Williams, "the father of the society," responded. Mr. Perry F. Nursey proposed the next toast, that of the President, and the President, in the course of his reply, proposed "The President-elect," to which Mr. Walmisley replied.

The Philharmonic Music Hall, Cardiff. Last week the Philharmonic Music Hall, Cardiff was re-opened, after having undergone complete alteration and renovation. About seven weeks ago, the building was closed to the public, and the work which was then begun was kept going practically day and night until the opening. Every particle of the inside was swept away, and a new proscenium, boxes, balcony, and promenade erected. The building is now in the hands of a Company. The alterations were carried out by Mr. J. E. Jackson, builder, Cardiff, from plans and under the superintendence of Messrs. James & Morgan, architects, Cardiff. The decorations were executed by Messrs. Geo. Jackson & Sons; and the Lincrusta work by Messrs. Fredk. Walton & Co. Entire new scenery has been set by Mr. H. Churchward.

South Weald, Brentwood. — There has been erected here a monument of Sicilian marble, having a Latin cross, 6 ft. 6 in. long, resting horizontally on five octagonal moulded and diapered shafts, beneath which is a moulded slab richly carved with orchids, a favourite flower of the late Mr. O. E. Coope, M.P., to whose memory it has been erected, together with the elaborate alabaster reredos in St. Mary's, Whitechapel (noticed in a previous number of the *Builder*), from the designs of Mr. E. C. Lee, architect, and executed by Messrs. Earp, Son, & Hobbs, of London and Manchester.

The Plumbers' Company. — At the examination, held on Saturday, there were twenty-five plumbers from various districts of London, Hertford, Crewkerne, and Brighton. The practical branch of the examination included pipe-bending, joint-wiping, and roof work; and the theoretical branch, questions relating to the several subjects of plumbers' materials, house-fittings, and sanitation. The examiners were Mr. Hudson (assistant chairman of the Registration Committee), Mr. Webb, Mr. Lyne, Mr. Lobb, Mr. Taylor, and Mr. Millis. Eight plumbers passed.—*City Press.*

Prizes for Art Workmanship. — The judges appointed by the Council of the Society of Arts have awarded the following prizes for objects submitted in the Society's Art Workmanship Competition:—Class I.—Painted Glass. —Second prize (15*l.*) to William Glasby, John E. Penwarden, and A. Lawrenson, for a painted panel, "Music," from a design by Henry Holiday. Class II.—Glass Blowing in the Venetian Style.—First prize (10*l.*) to T. Smith (workman), W. France and W. Watkins (assistants); second prize (5*l.*) to J. Hughes (workman), A. Johnston and H. Hart (assistants). Class IV. —Inlays in Wood.—Third prize (10*l.*) to F. Spalding, for a fancy octagon table. Class V. —Lacquer.—First prize (25*l.*) to Thomas W. Hay, for a specimen of lacquer on wood. Class VI.—Decorative Painting on Wood or other Material.—First prize (25*l.*) to John Eyre, for painting on wood for piano front, subject, "Vocal and Instrumental Music." Class VII. Hand-tooled Bookbinding.—First prize (25*l.*) to T. G. Cobden-Sanderson; second prize (15*l.*) to Fred. Mäullen. Class VIII.—Repoussé and Chased Work in any Metal.—First prize (25*l.*) to R. Holloway, for capital of column in hammered gilding metal; First prize (25*l.*) to A. Hubert, for specimens in silver and other metals, of repoussé and cast chasing work; Second prize (15*l.*) to W. Bullas, for repoussé curtain in brass, for drawing-room stove. First, second, and third prizes were offered in each class, but were not in all cases awarded.

The Home Iron Trade.—The English iron market shows a distinct improvement, and the prices of all descriptions of iron and steel, almost without exception, are higher than they were a week ago. There is a steady demand for pig-iron, and large purchases of iron have been made for speculative purposes, as it is fully expected that another "boom" will soon set in, especially in view of the probable larger demand from America, should the reductions in the tariff charges foreshadowed in President Cleveland's message to Congress become a reality. The week has seen a general rise in ordinary pig-iron of from 3d. to 6d. per ton, and in hematites of 1s. 6d.; but in some of the Scotch brands the week's advance has been as much as from 1s. to 2s. per ton. The rise in Scotch pig-iron warrants is nearly 2s. on the week. The improvement in the shipbuilding trade has sent up quotations of finished iron to the extent of 1s. 3d. a ton, whilst steel has experienced an improvement of as much as 5s. per ton, and Scotch steel-makers, in view of the rise in hematites, decline to do business except at an advance of 10s. on the last price, which was 6*l.* 5s. per steel plates. Never before during the year has the outlook been so bright, and we can only express the hope that the better condition of the iron trade will prove of a permanent character.—*Iron.*

The Guano Process for Precipitation.—The Governors of Wellington College have renewed their agreement with the Native Guano Company for five years, on the basis of an increased subsidy for the use of the process. According to the report of the Bursar and medical officer of the College "the system works well and with great ease." Moreover, we learn that before renewing the contract a special committee of the governing body made full inquiry, personally inspecting the sanitary processes in operation at other public institutions. They reported that the method adopted at the college, under the advice of Mr. Baldwin Latham, was, "under the circumstances, the most advantageous that could be used," and this expression of official satisfaction is formally recited in the deed of agreement.

The Mersey Railway Branch to Birkenhead Park.—It is stated that Messrs. John Waddell & Sons, Edinburgh, have all but completed the contract for this railway. The branch connects the Mersey Railway with the Wirral Railway at West Park Station, in the vicinity of Birkenhead, and opens up the coast resorts of New Brighton, West Kirby, and the Dee side to Liverpool for the first time by direct through communication *viâ* the Mersey Tunnel. We understand that the contractors have accepted an estimate from Mr. T. W. Helliwell to do the whole of the glazing and zinc roofing required on Park Station. Mr. Helliwell, it may be mentioned, did the whole of the glazing on Green Lane Station, Borough Road Station, and Shore Road, when the railway was opened two years ago.

The Art-Union of London.—The Art-Union of London having attained its year of jubilee, the Council have issued an address drawing public attention to the results of its fifty years' work, and pointing out "the advantages which it affords to its members, in the hope of attracting new subscribers, and thereby increasing its means of public usefulness." The objects of the society, as stated in the Charter, are to promote the knowledge and love of the Fine Arts, and their general advancement in the British empire, by a wide diffusion of the works of native artists; to elevate Art and to encourage its professors, by creating an increased demand for their works, and an improved taste on the part of the public. It is under the direction of a Council of the Members, whose services are honorary. In furtherance of these objects, the society has collected and disbursed no less than 594,000*l.*, to which considerable sums were added by prizeholders, in order to acquire works of higher value than the amounts of the prizes. The Art-Union claims to have been largely instrumental in creating the picture-buying public of the present day. "At its inauguration, in the year 1837, the number of purchasers of works exhibited in the public galleries was exceedingly limited, being confined to a small circle of wealthy amateurs. In one year alone, 1841, when the Art-Union subscriptions amounted to 5,300*l.*, and the first prize of the year was Mr. Maclise's "Sleeping Beauty," price 500*l.* (which was afterwards sold for 1,000*l.*), the list of artists whose works were purchased by the Art-Union comprised Ward, O'Neil, Witherington, Woolmer, Copley-Fielding, Creswick, Clint, David Cox, Corbould, Duncan, Uwins, Callow, Absolon, Fripp, Jutsum, Varley, Prout, Lee, De Wint, and others of lesser note, and there are very few of the Royal Academicians who have not received the support and patronage of the prizeholders of the Art-Union." The Art-Union also claims to have kept alive the art of line-engraving and that of medal die-engraving. On these and other grounds the Art-Union "still looks confidently for support to all lovers of art."

The Empire Palace, Leicester-square.—Messrs. Campbell, Smith, & Co. send us an account of the work they have carried out here. The scheme of decoration of the auditorium is somewhat Persian in character, the large oval ceiling being a kind of sumptuous Persian carpet. The sunlight will be a large flower in coloured glass, with the stamens and pistils of the flower electric lights. The general colouring is in turquoise and indigo blue, rose colour and crimson, with black and gold. The columns all round the theatre are white, with characteristic ornament in two blues and gold. This treatment is applied to the varions box fronts, using in (as far as possible) the raised ornamentation already existing. The back and ceiling of the gallery circle is treated with ruby and gold leather paper. The three other circles which are Louis Seize in treatment, are severally rose and gold; blue, white, and gold; and white and gold, the latter with plush panels. The upper circle is lighted by eighteen lamps of Persian design, in coloured glass, with gold frames. The walls of the private boxes are all covered with a highly-enriched gold leather paper. The pit entrance is decorated with Egyptian ornament, leading down to a solid gold leather paper on the lower walls, and the white and gold treatment of the ground floor. The foyer (which is Renaissance in character) is entered by a grand staircase, Pompeian in treatment. The entrance-halls are Indian, and are coloured with black and gold, and a deep rich crimson. The work has been done under the superintendence of Messrs. Romaine-Walker and Tanner, architects.

Obituary.—The death is recorded, at Giessen, of the architect Heinrich Ernst Schirmer, who was for thirty-five years in the service of the Norwegian Government, and during that time erected a number of public buildings in Norway. His principal work was the rebuilding of Throndhjem Cathedral, carried out between 1869 and 1871. The Norwegian Storthing twice refused Schirmer a pension for his long services, and it was in consequence of this refusal that he returned to Germany. The deceased was born at Leipzig, and had attained his seventy-third year.

The Priory Church at Brecon has received an addition to its stained glass of a window from the studio of Mr. Taylor, of Berners-street, the gift of Mr. Aneurin George, in memory of his wife and daughter.

Marble Replaced by Tin.—The *New York Times* says that the Board of City Trusts, Philadelphia, on the 15th of November "signed a contract by which the famous marble roof of Girard College will be replaced by an unsightly structure of tin. The cost of the work will be $9,000. That of replacing the marble would be $20,000. The defect in the roof was discovered about six weeks ago, when water was found leaking into the building. An examination of the marble revealed the fact that the surface was rapidly turning into lime. The Board of City Trusts met, and upon discussion of the matter made up their mind that the practical decomposition of the roof was due to the action upon it of an atmosphere impregnated with anthracite coal smoke. The roof had stood 41 years, and they concluded that $20,000 would be too much to invest in another structure of the same prospective life." The same paper says that Thomas M. Walter, the architect of the building, died at an advanced ago a few weeks ago. "The College was the pride of his life, although he had designed the extension of the National Capitol and many other famous buildings. He was therefore kept in ignorance of the mishap, which was partly due to the use of the roof, against his wishes, as an observatory for visitors."

Edinburgh Police Courts.—The Edinburgh Plans and Works Committee have recommended that provision be made for the better class of witnesses in the police court, and that double windows be placed in the court-room. It was moved that in view of the report of her Majesty's Inspector of Constabulary as to the whole accommodation in the police chambers the matter should be delayed. The Lord Provost thought that this showed the importance of having new Municipal Buildings, as, in a short time it would be found that in rejecting the Bill they would have to go to far greater expense than otherwise would have been the case. The recommendation was, however, adopted.

Wesley Chapel, New Swindon.—The Wesley Chapel, New Swindon, has, during the past month, been closed for extensive alterations. A hot-water heating-apparatus has been put in by Mr. James Gray, of Danvers-street, Chelsea. The building portion of the work was carried out by Mr. J. Webb, of Swindon, who is also laying down wood-block flooring. Three cathedral-glass windows have been executed by Messrs. J. Hall & Sons, of Bristol. The building is a large one, seating nearly 1,000 persons on the ground-floor. The total cost of the works now carried out is 220*l.* The work has been carried out under the supervision of Mr. A. G. While, of New-road, New Swindon.

Residential Flats in Westminster.—A large block of residential flats is being erected by Messrs. J. W. Hobbs & Co., Limited, of Queen's-buildings, Southwark Bridge-road, S.E., in Carlisle-place, Victoria-street, Westminster. The building is six stories in height, and has a frontage of 227 ft., with an elevation Classical in style, consisting of a central block and two end wings, flanked by composite pilasters, and faced with malms and stone dressings. A large block, consisting of about fifty flats, erected by the same firm, on the opposite side of Carlisle-place, is now approaching completion, about thirty flats being occupied. The architect for both blocks is Mr. George Baines.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	10	0	7	15	0
Teak, E.I. ....load	8	0	0	12	10	0
Sequoia, U.S. ....foot cube	0	2	3	0	3	0
Ash, Canada ....load	3	0	0	4	10	0
Birch ,, ...	2	0	0	3	10	0
Elm ,, ...	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,, ...	2	10	0	4	10	0
Canada	3	0	0	6	0	0
Pine, Canada red	2	0	0	3	10	0
,, yellow	2	0	0	4	0	0
Lath, Dantsic ....fathom	3	0	0	5	0	0
St. Petersburg	4	0	0	5	10	0
Wainscot, Riga ....log	0	0	0	0	0	0
,, Odessa, crown....	2	10	0	3	0	0
Deals, Finland, 2nd and 1st...std.100	7	10	0	9	0	0
,, 4th and 3rd	6	0	0	8	0	0
Riga	5	10	0	7	10	0
St. Petersburg, 1st yellow	8	10	0	14	0	0
,, 2nd ,, ...	7	0	0	8	0	0
,, white	6	10	0	8	0	0
Swedish	6	15	0	15	0	0
White Sea	7	0	0	16	10	0
Canada, Pine, 1st	16	0	0	24	0	0
,, ,, 2nd....	10	0	0	15	10	0
,, ,, 3rd, &c....	7	0	0	9	10	0
,, Spruce, 1st	8	0	0	9	10	0
,, ,, 3rd and 2nd	5	0	0	7	0	0
New Brunswick, &c....	5	0	0	7	0	0
Battens, all kinds	4	0	0	10	10	0
Flooring Boards, sq., 1 in., prepared, First	0	8	0	0	11	6
Second	0	6	6	0	7	6
Other qualities	0	4	0	0	6	0
Cedar, Cuba ....foot	0	0	3½	0	0	3½
Honduras, &c.	0	0	3	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4½	0	0	7
St. Domingo, cargo average	0	0	4½	0	0	6
Mexican ,, ...	0	0	3½	0	0	3½
Tobasco ,, ...	0	0	4	0	0	5
Honduras ,, ...	0	0	4	0	0	5
Maple, Bird's-eye	0	0	5	0	0	7
Rose, Rio ....ton	8	0	0	11	0	0
Bahia....	7	0	0	9	0	0
Box, Turkey	5	0	0	12	0	0
Satin, St. Domingo ....foot	0	0	5	0	0	9
Porto Rico	0	0	6	0	0	10
Walnut, Italian	0	0	4	0	0	5½
METALS.						
IRON—Bar, Welsh, in London...ton	4	15	0	5	0	0
,, ,, in Wales	4	5	0	4	10	0
,, Staffordshire, London	5	10	0	6	0	0
COPPER—						
British, cake and ingot ....ton	0	0	0	0	0	0
Best selected	0	0	0	0	0	0
Sheets, strong....	0	0	0	0	0	0
Chili, bars	75	0	0	0	0	0
YELLOW METAL....lb.	0	0	6	0	0	
LEAD—						
Pig, Spanish ....ton	14	5	0	0	0	0
English, common brands....	14	15	0	0	0	0
Sheet, English	15	10	0	0	0	0
SPELTER—						
Silesian, special ....ton	19	5	0	19	10	0
Ordinary brands....	18	15	0	19	0	0
TIN—						
Straits....ton	166	0	0	0	0	0
Australian	166	0	0	0	0	0
English ingots	0	0	0	0	0	0
OILS.						
Linseed ....ton	19	5	0	19	10	
Cocoanut, Cochin	30	0	0	31	0	0
Ceylon	23	15	0	0	0	0
Palm, Lagos	22	0	0	0	0	0
Rapeseed, English pale	26	10	0	27	0	0
,, brown	25	5	0	0	0	0
Cottonseed, refined	20	10	0	0	0	0
Tallow and Oleine....	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	6	0	0
,, refined....	5	0	0	12	0	0
TURPENTINE—						
American, in casks ....cwt.	1	4	9	0	0	0
TAR—						
Stockholm ....barrel	0	15	0	0	0	0
Archangel	0	10	6	0	0	0

CONTRACTS AND PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Kerbing and Channelling Works	East Barnet Valley L. B	*Official*....	Dec. 19th	ii.
Cast-Iron Parapet, Tower Bridge....	Bridge House Estates Committee	T. Wolfe Barry	do.	ii.
Street Improvements	Edmonton Local Board	*Official*	Dec. 27th	ii.
Gasholder Tank, &c....	Gas Light and Coke Co.	do.	Dec. 29th	ii.
Lock-up, Watford	County of Hertford	Urban A. Smith....	Jan. 3rd	x.
Making-up Road	S. Hornsey Local Board	E. Fry....	Jan. 4th	x.
Retiring-Rooms, Finsbury Park	Met. Board of Works...	*Official*	Jan. 10th	ii.
Various Works	School Brd. for London	do.	Not stated...	x.
New Schools	Ramsey School Board...	H. Bushell....	do.	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Foreman of Roads....	Chelsea Vestry....	100*l.*, &c.	Dec. 28th	xiv.

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays.*]

BETHNAL-GREEN. — For stabling, &c., for Mr. James Cox, mineral water manufacturer. Mr. H. A. Wooster Reeves, architect, 14, Devonshire-square, Bishopsgate. Quantities by the architect :—

Garratt & Son, Loughborough Junction	£2,700 0 0
G. W. Beale, Cambridge-heath	1,905 0 0
F. & F. J. Wood, Mile-end	1,877 0 0
Thomerson & Son, Hackney-road	1,845 0 0
J. Hughes, Old Ford	1,825 0 0
W. Shurmur, Lower Clapton	1,692 0 0
Horlock, Manor Park	1,670 0 0
Taylor & Co., Cambridge-road	1,640 0 0
G. Lusk, Mile-end	1,633 0 0
A. Diss, Colchester (accepted)	1,590 0 0

BEXHILL-ON-SEA.—For erecting Jubilee reading-room. Mr. Richard A. Hill, architect :—

S. Ockenden	£841 0 0
C. Erry	789 0 0
W. G. Newman	729 10 0
J. Cole	691 15 0
J. King (accepted)	641 0 0
T. S. Todd	627 0 0

[All of Bexhill.]

CAMBERWELL.—For paving with Limmer Asphalte Marmora-road, for the Vestry of St. Giles, Camberwell :—

Val de Travers Asphalte Company	£598 17 0
French Asphalte Company	495 6 0
Limmer Asphalte Company	474 19 0
Brunswick Rock Asphalte Company	468 1 4
Bradshaw & Co., 52, Queen Victoria-street, London (accepted)	413 0 0

CATERHAM.—For the erection of a house on the Streeter Estate, Caterham. Mr. Henry Ling, architect, Northumberland-chambers, Charing-cross, W.C. :—

T. Churchill, Godstone	£795 0 0
J. & J. Ward, Warlingham	715 0 0
Hunter & Bryant, Kenley (accepted)	689 0 0

CATERHAM.—For alterations and additions to house required for new Post-office premises, Caterham. Mr. Henry Ling, architect, Northumberland-chambers, Charing-cross, W.C. :—

Hunter & Bryant (accepted)	£255 0 0

[No competition.]

ENFIELD.—For the supply and laying 12,000 ft. of straight kerb, for the Enfield Local Board of Health. Mr. Wm. Kitteringham, surveyor :—

	Cornish per foot. s. d.	Aberdeen per foot. s. d.
Griffiths, London	—	2 9
Williamson, Tottenham	—	2 5
Mowlem & Sons, Westminster	2 2	2 5
Marshall, Brighton and Stratford	2 1	2 3
Nowell & Robson, Kensington	2 0	2 2
Bloomfield, Tottenham	1 11	—
Rutty, Bromley-by-Bow	1 11	2 1
Wheeler, London	1 9¾	—
John Jackson,* Enfield	1 9	2 2½
Palmer, Birmingham	1 8¾	—

* Accepted for Cornish.

LONDON.—For the erection of a new Welsh chapel, Falmouth-road, New Kent-road. Mr. William C. Evans, architect, 3A, Poets'-corner, S.W. Messrs. Young & Brown, surveyors, 5, Henrietta-street, Covent-garden :—

J. & W. Faulkner	£6,585 0 0
Gregory & Co.	6,157 0 0
Greenwood	6,117 0 0
Grover & Son	6,065 0 0
Howe & Williams	6,054 0 0
Peto Bros.	6,026 0 0
Downes	5,853 0 0
H. L. Holloway	5,647 0 0
H. & R. Evans	5,086 0 0

LONDON.—For rebuilding No. 49, Great Titchfield-street, W., for Mr. Edwin Parr. Messrs. Wylson & Long, architects, 21, King William-street, W.C. Quantities supplied by Mr. Arthur W. Saville, 29, Strand, W.C. :—

Simpson & Son	£1,587 0 0
W. Bodien	1,537 0 0
W. Pearce	1,502 0 0
Hall, Beddall, & Co.	1,434 0 0
G. H. & A. Bywaters	1,423 0 0
J. T. Chappell	1,407 0 0
W. Rhodes	1,390 0 0
W. Oldrey & Co.	1,370 0 0
Patman & Fotheringham (accepted)	1,337 0 0

LONDON.—For repairs at Nos. 66 and 66A, Berwick-street, W., for Mr. W. Eckstein. Mr. Arthur W. Saville, architect, 29, Strand, W.C. :—

T. W. Morris (accepted)	£260 0 0

LONDON.—For the finishing of carcasses, situate 41 and 43, Walburgh-street, St. George-in-the-East, and building additions at the rear. Mr. William Livermore, architect :—

A. Nicholls, Leytonstone (accepted)	£357 10 0

NEWMARKET. — For residence for Mr. W. B. Sheppard. Messrs. Holland & Son, architects :—

Samuel Chapman, Norwich	£1,795 0 0
Cowell & Son, Soham	1,679 0 0
Simpson & Son, Newmarket	1,650 0 0
Saint & Son, St. Ives	1,638 0 0
Plummer, Rattlesden	1,628 0 0
Hook & Tebbitt, Soham	1,625 0 0
Kerridge & Shaw, Cambridge	1,461 0 0
Mason & Son, Haverhill	1,420 0 0
Blyth & Hunt,* Newmarket	1,413 0 0

* Accepted.

SOUTHEND.—For building three houses on Royal-terrace, for Mr. J. Brown. Mr. G. Sherrin, architect :—

J. Chapman, Hackney (accepted)	£3,698 0 0

SURBITON.—For building house at Ditton-hill, for Mr. B. Everest. Mr. Geo. Sherrin, architect :—

J. Chapman, Hackney	£900 0 0

[No competition.]

WEST HAM.—For repairs to pumping engines, for the Corporation of West Ham. Mr. Lewis Angell, Borough Engineer :—

Hunter & English, Bow	£532 0 0
Castray	515 0 0
Chapman	485 0 0
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M. T.—H. M.—H. H. McC.—G. B. (see paragraph in *Builder* for January 17, 1880, page 85).—E. T. (too small).

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Pictor's Monks' Park. Combe Down.
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THE CHELYNCH STONE. The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.
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WILLIAM WHITELEY, Westbourne Grove,
London, Oct. 12th, 1887.

HOBBS, HART, & CO., LIMITED.

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The recent fire at my establishment in my opinion subjected them to the greatest possible test, and through all, they proved invulnerable.

The contents of both Strong Rooms and Safes were entirely preserved, although the fire was of such intense destructive force.

You will be pleased to hear that it has been decided to adopt your Patent Clutch-rebated Doors for all the party-walls in the new buildings now in course of erection.—I am, Gentlemen, faithfully yours,

(*Signed*) WILLIAM WHITELEY.

Offices and Warehouse: 76, CHEAPSIDE, London; Manufactories, Wharncliffe Works, Arlington-street, London, N.